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A CONTRIBUTION TO THE PEDAGOGY OF ARITHMETIC*

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I. INTRODUCTION

Nearly three centuries ago Comenius undertook to give a method to teaching. At the present time there is a widespread movement through Experimental Education to establish it upon a sound scientific basis. Much that now finds acceptance in both curriculum and didactic procedure has found a place through conservative respect to traditional philosophies and dogmas of the past, coupled with some later

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empirical and pragmatic considerations. The present critical studies and experiments are concerned with both the subjects in the curricula and the methods of instruction. In these researches many laboratories have been busy, many investigators have been active, and much helpful work has been done. It is now necessary that the results should be brought together and put into usable form. Experimental Psychology has been too busy in exploring many fertile fields, as yet, to give attention to the full bearing of its discoveries upon Didactics, while Experimental Pedagogy is frequently too empirical to be scientific. For these reasons it is essential that the synthesist should bring together the modern needs of Pedagogy and the contributions of Experimental Psychology germane to the processes of learning, and state in clear and simple language the norms of method so the average teacher, who possesses little or no technical nomenclature of the psychological laboratory, or even of the experimental pedagogist, may find assistance in the daily routine of school duties.

It is the purpose of this research to bring together many of the recent tests and experiments in Arithmetic and, in connection with conclusions drawn from them bearing upon better texts and methods, to evaluate them for practical use in the regular school work.

II. Brief Historic Sketch of Arithmetic

Arithmetic is the oldest science developed by man. As an art it runs much farther back into antiquity. Its first use is so remote that it is difficult to separate the mythical from the real. Anthropological investigations have brought much helpful material to light and the historical genesis of Arithmetic is coming to be better understood.

Callisthenes found in Babylon, in 331 B. C., when Alexander the Great captured the city, burned brick astronomical records running back to 2234 B. C. These were sent to Aristotle, according to Porphyry. In Egypt no uncivilized state of society has been found. Their oldest mathematical books date back to 3400 B. C., although Josephus (62, chap. 7, p. 50) gives Abraham credit for introducing Arithmetic into Egypt, when he says:

> "He communicated to them Arithmetic and delivered to them the science of Astronomy, for before Abram came into Egypt they were unacquainted with those parts of learning, and that science came from the Chaldeans into Egypt, and from thence to the Greeks also."

Among the Greeks and Romans, as well as among most

primitive peoples, systems of counting were clumsy and imperfect, and it became necessary to invent symbols for numbers and systems of numeration for the practical use of these symbols. Counting-boards and the abacus were early invented and have persisted down to the present time. We find the Chinese and Japanese (64, 179) using the *swan-pan* and the *soroban* very generally even to-day. It is of historic interest to note that the first printed Arithmetic, published at Treviso, near Venice, was entitled "The Art of the Abacus for Arithmetic." Because of their awkward number symbols the Romans used calculating-boards for computations and employed their symbols only in stating results. The process of calculation derives its name from the Latin, *calculus*, "pebble," since pebbles were used as counters by many people around the Mediterranean.

The so-called Arabic characters are more properly Hindu. Leonardo of Pisa, in 1200 A. D., obtained them from the Moors and two years later he published a system of computation using them. As he had obtained the characters from the Arabs they received the name Arabic. They have been traced, however, to the Hindus. After their introduction into Europe, a long contest ensued between the abacists and the algorists, but the Hindu system gradually spread over the continent and was well known by 1400 A. D. Merchants discarded the Roman notation in 1550 and the monasteries and colleges followed a century later. With the new system, Florentine traders and writers developed double-entry bookkeeping and worked out seven operations: Numeration, Addition, Subtraction, Multiplication, Division, Involution, and Evolution, while Italian and English arithmeticians simplified the processes. The Arabs added from left to right. Garth, an Englishman, devised a plan to add from right to left. One has only to compare the solution of a problem in Division by Pacioli or Tartaglia with the work done even in the third grade of the schools to-day to note what simplification has taken place.

The invention of printing with movable types, together with the great commercial activity carried on through the Hanseatic League and other agencies gave a remarkable stimulus to algoristic Arithmetic in Europe. In the sixteenth century sweeping transitions occurred. The manuscript Arithmetics were replaced by printed books; Roman symbols yielded to the Hindu characters; the Arithmetic of the learned became the possession of the common people; and counters disappeared in favor of figures. Many authors were found in Italy, France, Germany, Holland, and England, and the art of reckoning with the pen rapidly replaced the art of calcu-

lating with the abacus. The Hanseatic League established *Rechenschulen* along its trade routes and these commercial schools had much to do in keeping Arithmetic out of the regular schools. The first German Arithmetic appeared in 1482 from the pen of Ulrich Wagner, a *Rechenmeister* of this League. Many topics, such as Partnership with Time, came into use then as a practical business subject, and have been retained in our modern text-books long after the business world has discarded the methods they present. It was through the influence of Pestalozzi that Arithmetic was given such a prominent place in the schools. Despite strenuous efforts to discredit its value and to minimize its standing among the branches of learning in recent years, it is still receiving from 12% to 26% of the entire time devoted to recitation in the Elementary Schools throughout the civilized countries of the world (90).

III. Psychology of Arithmetic

The big question among teachers is to know how to teach according to sound principles. As with other subjects in the curriculum, scientific methods in Arithmetic must ultimately be based upon genetic psychology. Until we approach from the lower side the many questions of material and method, there will be only an approximation to the real solution. Most methods have been superimposed, so to speak, upon the child from above and only in late years has there come any decided scientific tendency to study the genesis of number and the processes of computation from the child's point of view. These studies are yet confessedly few and do not warrant an attempt at a full statement of scientific method based upon them. What has been learned may assist in better pedagogical procedure and incite to further original research.

Genesis of Number Ideas.—Major (75, 167) observed his son among other things for the rise of his ideas of number. He found him able to miss one ball out of his wagon, when three were in it, at the age of 21 months. While the child had a confused idea of 3, 4, and 5, at three years of age, Major received, many times, the correct number, 1, or 2, or 3, when apples were used, by throwing them on the ground and asking for a certain number. Later, the child's interest declined. Preyer's boy missed one of his 10 toys (75, 166), at the age of only 18 months, and at 878 days of age counted his nine-pins by standing them in a row and saying: "Eins! Eins! Eins! Noch Eins! Noch Eins!" and so on to the end of the row. On her 584th day, Dearborn's little daughter

(32a, 176) counted 6 cattle in a picture by saying: "One, two; one, two; one, two." He thinks she knew the number 2 as early as the 543rd day, and also says the same thing about 1. Decroly thinks his little girl knew 2 before she recognized what 1 is (33a, 119). The 2 seemed to remain for some time as the only number the child grasped. Binet's daughter at 30 months of age comprehended 2, and could get the idea of 4 at 51 months (33a). Lindner's son at 23 months had the number 2 (33a). Moore's three children had the idea of 2 at 22, 26, and 29 months; and a good idea of 3 at 32, and 53 months. Scupin's child (33a) knew 2 at 22 months.

Clara and William Stern studied their children very carefully and report that they could use numbers correctly in connection with apples, for instance, long before the abstract idea of number arose, or even before number could be rightly applied to other objects of less interest (33a). Ordinals were learned before cardinals. Major reports ordinals and cardinals as confusing to his child (75, 173), while Hilde Stern could get the fifth finger, but did not seem to understand the sum of her fingers and thumb on one hand (74a). Decroly made many careful observations upon his daughter and contributes a very interesting opinion that she knew the number 2 long before she had the idea of 1. This does not seem to have been observed by others who have studied the genesis of number in infants and deserves to have more attention. While his child got the idea of *two* at 19 months of age, she was able to differentiate *three,* at 28 months, from *two* or *one.* In another month she picked out 2 objects by the aid of her fingers, and at 35 months did this without using the fingers. At 41 months, she seemed to have the idea of 3 quite well in mind and in another month the idea of 4 appeared to be somewhat clear. Still, as many other child-observers have found in their studies, there was a reversion of both interest and apparent ability later, and at 46 months of age the little girl had a confused idea of 3 and 4, calling them simply, "more." At 51 months, 3 arose again to clearness and soon was well comprehended. By her 57th month she was able to hand the correct number of objects, up to 5, indicated by having held up for her problem one or more fingers. This showed an ability to abstract the idea of number, say from four fingers held up by her father, and of applying the number thus gained to the apples or other objects asked for. Sully found his child at 4 years 3 months calling big beads "6," smaller ones, "5," and still smaller ones, "4." At 5 years old, however, he placed four crab-apples upon the sand, added two to them mentally, and begin-

ning with calling the first one "3," counted them correctly up to 6. He could also count his four playthings, two dolls, a tin soldier, and a shell, from memory, after they had been put away. Sully says (121, 352) that the drawings of children 5 years of age show small regard for the five fingers of the hand. In the growth of infants in number ideas we find marked individual differences, and it can only be said yet that the idea of number seems to be forming intelligently about the fourth year (75, 165).

Lietzmann (72, 22) thinks schools often make a mistake in proceeding as if the child has no ideas of number when it enters school. "The beginnings of number lie much earlier. When the child comes to school, it will, in a majority of cases, already know the number words possibly up to 10, or 12." Of 1,217 children entering the *Volksschulen* in Breslau, 10% could count up to 5, 78% could count up to 10, 4% up to 100, and nearly 1% over 100.

Ballard says (9, 58): "It is a well known fact that children learn to count of their own accord. They do it at home, on the playground, and at their games. It is impossible to stop them." "I tested a school where no counting is especially taught and found that about 60% of the children could count up to 20, before they were 5 years old, and about 30% could count up to 30 before they were 6." Meumann (79, Bd. 2, 345) agrees with Preyer and the other few child psychologists that the child has a somewhat fully intelligible use of numbers from 1 to 10 at the earliest toward the close of the 4th year of its life. In his report of the Fielden School, Manchester, Eng., Harrison (54, 269) says the children play with dominoes and "the result is, that already the five-year olds are able to write correctly on the blackboard the result of 2 plus 7, 9 plus 5, etc." This agrees with Montessori who has children at three to begin counting with buttons, plates, or money, and later with sets of blocks.

There are two very distinct schools of educators on the question of the origin of the child's notion of number. One party maintains that ideas of number are developed through the simultaneous perception of several objects, or stimuli, presented to the senses. With Newcomb (87) they hold that "our teaching of numbers is too abstract,—too much dissociated from objects of sense." Many experiments have been performed in recent years to determine how many objects one may be able to apprehend accurately without counting. For this purpose the time exposure is made as brief as possible so as to prevent counting. Nanu (86) used bright dots on a dark background and gave a time exposure of 33/1000 of a second. She ar-

ranged the dots in different figures and found that 5 could be perceived in a line, 10 in a parallelogram, and 8 in a hexagon in 75% of the cases. Lay (67) performed many experiments and found a greater percentage of successes attended the arrangement of dots in quadrate form. He is a strong advocate of the objective method of teaching the early number work. He quotes the experiments of Goldscheider and Müller, von Scheele, Schneider, Külpe, Cattell, Dietze, Warren and Messenger in support of his claims. However, his contentions are not without vigorous criticism from Walsemann, Knilling, Knoche, and the whole school of Herbartians. McLellan and Dewey (76) would base the development of number upon measuring,—upon the ratio idea. They hold that there is no number without measurement (p. 242) nor measurement without the fraction implied. Tear reviewed the Speer arithmetic a half generation ago and quotes Newton (123, 631): "Number is the abstract ratio of one quantity to another quantity of the same kind." So, also, the great Swiss mathematician, Euler, is cited: "Number is the ratio of one quantity to another quantity taken as a unit."

In direct opposition to this notion of the origin of number in the child mind and to the consequent procedure in teaching, there is a strong party which maintains that the presentation of the objects in a series, or the stimuli in succession, is the proper method. Gilbert (43, 110) believes that counting is "the first step in systematic thinking," while Phillips decides (95, 227) that "the first step is surely the formation of the series-idea." He holds that counting is fundamental, and that children forbidden to count on their fingers sometimes count by using their toes, or move an elbow, or press a muscle, or clear the throat slightly in order to follow the series. Among his reasons for rejecting the Grube method, Badanes says (6, 34): "It is false from the point of view of Arithmetic as a science and as an art. It ignores the process of counting." The dispute really carries us back into the philosophical question as to whether number has time-relation only, or space-relation only, or neither, or both. It will suffice to present the writer's view on the pedagogical significance of the discussion to quote with approval the words of Meumann (79, 338): From the psychological point of view number-concepts seem to possess both temporal and spatial qualities, and either of the views alone represents necessarily a one-sided notion, that by the series-method and by the simultaneous-method the child gains something of power not contained in the other. "The fact that by both methods good results can be obtained shows that a complement of these methods, or the simultaneous employment of

both, must be the right way of complete comprehension of number for the child."

On the side of anthropology, many systems of notation have been found among primitive peoples, and no definite correlation seems to exist between these systems and the civil development of the tribes. The highly civilized Peruvians knew almost no arithmetic as an art and nothing of it as a science, according to Conant (24, 150), while the Yorubas, a very barbarous tribe in Africa could count quite expertly. Many savage tribes count only up to two, and have number words only for "one," "two," and "many" or some other verbal device for distinguishing their first definite number ideas from the indefinite ones lying beyond. The lowest Brazilian tribes count to 3, and the Carribees, Galibi, Abipones and many others go up to 4. As a rule the South American and Australian tribes count seldom above 3 or 4. Among some of the Australians only binary systems prevail, while ternary and quaternary systems abound among the Indian tribes of South America. Yet, some Pacific island tribes have been found with ability to count up into millions in their trade in fish and breadfruit. Quinary scales are widely diffused throughout the world, and a few octonary systems are believed to have existed. Some scant traces of vigesimal systems have been found. All these facts show how slowly and imperfectly the concept of number has arisen among primitive peoples, who seem to have used numbers only as necessity forced the matter upon them. Need for counting in their barter with one another had more influence upon number than did their general intelligence, or any subjective interest in it. Conant (25, 31) says:

"If the life of any tribe is such as to induce trade and barter with their neighbors, a considerable quickness in reckoning will be developed among them. Otherwise this power will remain dormant because there is but little in the life of primitive man to call for its exercise."

More recently Boas (10, 65-66) has stated this as follows:

"The fact that generalized forms of expression are not used does not prove inability to form them, but merely proves that the mode of life of the people is such that they are not required; that they would, however, develop just as soon as needed. This point of view is also corroborated by a study of the numeral systems of primitive languages. As is well known, many languages exist in which the numerals do not exceed two or three. It has been inferred from this that the people speaking these languages are not capable of forming the concept of higher numbers. I think this interpretation of the existing conditions is highly erroneous. Peoples like the South American Indians (among whom these defective numeral systems are found), or like the Eskimo (whose old system of numbers probably did not exceed ten), are presumably not in need of

higher numerical expressions, because there are not many objects that they have to count. On the other hand, just as soon as these same people find themselves in contact with civilization, and when they acquire standards of value that have to be counted, they adopt with perfect ease higher numerals from other languages and develop a more or less perfect system of counting. . . . It must be borne in mind that counting does not become necessary until objects are considered in such generalized form that their individualities are entirely lost sight of. For this reason it is possible that even a person who has a flock of domesticated animals may know them by name and by their characteristics without ever desiring to count them. Members of a war expedition may be known by name and may not be counted. In short, there is no proof that the use of numerals is in any way connected with the inability to form concepts of higher numbers."

It may not be an unfair or unwarranted deduction from all these studies and views to believe that children at school entrance in America may have ample ability to delight in numbers although they may show little interest in them up to that time. The child-mind no doubt expands intelligently with its growth in experience with objects of multitude, much as the development of the primitive mind does, as described by Boas. Its early work with these numbers can be motivated and made attractive in a manner paralleling the race expansion. "The child is a natural symbolist," says Mary R. Alling-Aber (3, 171). "A corn-cob with a dress on it will do for a baby and a stick with no additions, for a horse. To let one thing stand for another is as easy to a child as to breathe." There is an easy transition from the objects, too, to numbers and then from numbers to symbols at an age corresponding to school entrance.

Time of Beginning Arithmetic.—With regard to the time when Arithmetic should be introduced into the schools and when it should be completed there is some difference of opinion, and the matter is just now in the polemical stage. One group of educators holds that it should not be taught, except incidentally, in the first grade, or first and second, or the first three grades. The majority report of the Committee of Fifteen of the National Educational Association, in 1895, urged the beginning of the subject in the second and its completion in the sixth grade. Burnham (17, 65) believes there is "ample reason for postponing the work of Arithmetic until the age of 10, or, more accurately, to that stage of development which is likely to be found in normal children at this age. While it is greatly to be desired that more investigations be made in regard to this subject, with our present experience this seems to be a wise rule." Chartres (22, 278) says that "separate Arithmetic classes should not be taught in the first grade; it is better to defer them to the second

grade, and probably it would be better to begin Arithmetic in the fourth grade if our text-books were built with that in view." So also writes Stamper (113, 258): "The general tendency in this country is to refrain from all drill work in the first year. In fact, some schools defer such work until the middle of the second year, or the beginning of the third."

On the other side of the controversy are to be found many ardent protagonists. Smith (105, 128) says: "Not to put Arithmetic as a topic in the first grade is to make sure that it will not be seriously or systematically taught there in nine-tenths of the schools of the country. The average teacher, not in the cities merely, but throughout the country generally, will simply touch upon it in the most perfunctory way. Whatever of scientific statistics we have show that this is true, and that children so taught are not, when they enter the intermediate grades, as well prepared in Arithmetic as those who have studied the subject as a topic from the first grade on." In a very recent article (106, 95) he further argues: "All the talk about having no Arithmetic in grades 1 and 2, or leaving it to the whim of the teacher, has not shaken the belief of the great schools of the world in the wisdom of Pestalozzi's judgment." "Arithmetic is a game and all boys and girls are mere players. We have not learned this very thoroughly yet, but we are making progress." Montessori (83, 326) claims to achieve some wonderful results even with children of pre-school age. Greenwood (47) dissented from the report of the Committee of Fifteen and furnished a *verbatim* report of some actual teaching and results in the Kansas City Schools as proof of his contention that Arithmetic is eminently successful in the lower grades. "No greater difficulty to get small children to grasp the nature of a fraction as such than in getting them to grasp the simple whole numbers. . . . Children get the idea of half, third, quarter, long before they enter school." Hence, he advocates teaching them to add, subtract, multiply and divide fractions in the first grade. Cook (7) says: "I visited the Kansas City schools and testify that Mr. Greenwood has not overestimated conditions. I took some third-grade work home and tried it on Normal students, and they couldn't do it as rapidly as those children did it." In Germany a little more than 20% of the time in the first two grades is devoted to Arithmetic. In the United States, according to the report formulated in 1911 by the American Committee of the International Commission on the Teaching of Mathematics (56, 16-65, 75-78) cities reporting about one-tenth of the school population of the country show that Arithmetic is taught as a topic in the first grade in 71.5%; in the second grade it

is introduced in 22%; and in the third grade in 6.5%. (See Table E for further details.) In country, or rural schools, it may be said to be taught in the first grade in practically all the schools.

The writer personally believes that there should be systematic teaching of numbers in the first grades. The child's natural interest in numbers and the rich opportunities for presenting numbers in concrete objects should be utilized. Mere rote work must be avoided, but these early years are of inestimable value in furnishing a substantial foundation in the child's individual growth in the comprehension of numbers. Counting may also be used in these grades to diversify the work and add to the useful results.

Utility and Discipline.—Another question of much interest and one upon which there is considerable controversy yet, is that of the so-called disciplinary value of Arithmetic. The matter is at least as old as Plato, who says in his Republic: "And you have further remarked that those who have a natural talent for calculation are generally quick at every other kind of knowledge, and even the dull, if they have arithmetical training, gain in quickness, if not in any other way." In mathematics, perhaps, more than in any other subject, the doctrine of formal discipline, or transfer of training, has been most successfully maintained. If Arithmetic has not been kept in the curriculum as a practical subject it has staid there as a disciplinarian of the intellect. John Stuart Mill attributed his success in speculation to his mathematical training,—"the habit of never accepting half solutions of difficulties as complete, never abandoning a puzzle, but again and again returning to it until it was cleared up; never allowing obscurities in a subject to remain unexplained because they did not seem important; never thinking I perfectly understood any part of a subject until I understood the whole." This is not the place to discuss the general question of mental discipline, or transfer of training, upon which an extensive and varied literature has been produced within the past decade. It is not well to accept either of the two extreme positions noted in the literature, but at present the value of arithmetic in the school course may be defended upon both practical and disciplinary grounds. In its utilitarian aspects the demands of every-day commercial life are sufficient proof. And on the subjective side, if it should be shown that one intellectual trait does not and cannot assist any other, still the *Einstellung* toward matters under consideration trained into children in Arithmetic may be advanced as evidence of the subjective discipline of Arithmetic.

The certainties found in Arithmetic, too, have a moral value to children as they approach so much of uncertainty in other studies.

IV. Experimental Studies

Many experimental studies of the teaching of Arithmetic and the various processes of learning the different operations in handling numbers have been made, notably within the past two years. While they have been concerned principally with only the fundamental operations, a synthetic study of their results should throw some added light upon our problem of finding a scientific basis for Arithmetical Methods. Thousands of children have been tested and drilled under more or less controlled conditions, and the results are now becoming available for comparative pedagogical purposes. Much yet remains to be learned by further experimentation, but a consideration of those studies that have been made and published will assist materially in determining more clearly than has been done heretofore the weakness of the present methods, their strong features, and suggest the next step in the search for a sound pedagogy of Arithmetic.

Influence of Puberty.—Voigt made some studies upon children from ten to fourteen years of age in the Volksschulen (80, 117). Instead of using the ordinary decimal system of notation, he employed systems in which 8 and 6 were the bases. By this means he reduced to a minimum the use of knowledge already possessed by the children. Among his results are these: 1, The learning of new systems does not progress gradually, but by "leaps;" 2, Between the ages of 13 and 14 the boys showed a marked increase in ability; 3, Between the ages of 12 and 13 the girls showed this rise in ability. It was noticed that the onset of puberty gave a decided increase in the ability to work independently in numbers. Prior to this time the children as a rule work mechanically, according to "copy." The boys reached the period of independent work from 1 to 1½ years in physiological age later than the girls; hence, the girls of the same age as the boys after the beginning of puberty are usually more than one year ahead of them in number work. That is, problems which boys can solve independently in their eighth year in school can be as easily solved by girls in their seventh year. Rice and Courtis both found the 6th grade especially troublesome, as there were disturbances in the scores of that grade in the many records which they gathered. In the recent tests in Boston (38, 23) this errancy was found in the 7th grade. Since Boston admits children at five years

of age, the 7th grade there would correspond to the 6th grade in physiological age elsewhere. It appears from the tests of Voigt, Rice and Courtis that the dawn of adolescence, affecting as it does markedly the physiological nature of the child, has also a great effect upon its ability to do accurate and independent work with numbers. Before this time, mechanical work is done; after this period the rise of independence and self-reliance changes the emphasis to the reasoning phases of arithmetical solutions.

Value of Drill.—A number of experimental studies have been made to arrive at some fundamental facts concerning the value of drill. Brown (13, 81ff) gave the Stone tests to 6th, 7th, and 8th grades of the practice school of the Eastern Illinois State Normal School, consisting of 51 pupils, 18 boys and 33 girls. Two sections were made of them. One was drilled upon fundamentals for five minutes each day for thirty days, while the other pursued regular work. A test at the end showed that the drilled pupils made a much larger advancement than the others. His results also showed that the 6th grade children profited more from drill than did the next higher grades. Later, he carried his experiments into three school systems (13, 488), confining the tests to the 6th grade and to the four fundamental operations. In all, he tested 222 pupils, 110 boys and 112 girls. Only twenty days were allowed between the first and the second tests, during which time one group in each school was given five minutes extra drill in the fundamentals besides the regular work which the other section followed. The results showed a gain on the part of the non-drill group in problems solved of 6.4%; in Addition, of 6.8%; in Subtraction, of 11.9%; in Multiplication, of 10.9%; in Division, of 15.4%. The drill group gained on these same items respectively: 16.9%, 18.5%, 32%, 24.1%, and 34.2%. These are only the aggregates. Of the 112 cases of drilled pupils, 95 gained, 5 did not advance and 12 lost. Of the 110 cases of non-drilled pupils, 50 gained, 7 had the same score as at the beginning, and 53 lost. In the individual studies and aggregates submitted it appears that the drilled groups gained from two to three times as much as the non-drilled groups. "All teachers of the drill classes reported an improvement also in the text-book work." The drill excited them to keener interest in the regular lessons (13, 489).

In March, 1912, Phillips (93) gave the Stone tests to 33 boys and 36 girls of the 6th, 7th, and 8th grades. Each grade was divided into two groups, one pursuing regular work and

the other receiving in addition a ten-minute drill daily upon fundamental operations and upon reasoning upon mental problems. At the end of two months the two groups were again submitted to the Stone test with the following results: 6th grade non-drill, gain in Fundamentals, 55%; drill group, 45%; 7th grade, in Fundamentals, non-drill, 10%; drill group, 22%; 8th grade, in Fundamentals, non-drill, 16%; drill, 25%; all grades, gain in Fundamentals, non-drill, 27%; drill, 31%. In Reasoning: the 6th grade gain was: non-drill, 36%; drill, 55%; 7th grade, non-drill, 17%; drill, 29%; 8th grade, non-drill, 12%; drill, 15%; all, non-drill, 22%; drill, 33%.

Starch (114) gave 15 observers eight preliminary tests, six in arithmetical operations and two in auditory memory span for numbers. Of these observers, 8 were then given fourteen days' practice in mental multiplication of 50 problems each day, totaling 700 problems. The other 7 observers were given no practice. On the second test the practiced observers showed from twenty to forty per cent improvement more than the others in the arithmetical operations, while there was little change in the memory span in either group. Thorndike (125) experimented with 33 adults to learn the increase in efficiency in mental multiplication, judged by the reduction in the time required. He used no figure below 3 and none was repeated. All his subjects showed improvement through drill, and he says:

"The fact that these mature and competent minds improved in the course of so short a training so much as to be able to do an equal task in two-fifths of the time first taken is worthy of attention." "The most ardent advocate of the general influence of specific practice would not, I judge, claim that ten hours drill in any one thing could improve an already well-educated adult 50%, or 5%, or even 1% in the average of all his intellectual processes."

He found a rapid rise in the rate of improvement during the early practice, an observation generally confirmed by all experimenters. At another time he used 19 adult subjects, 8 men and 11 women students in Columbia University, giving them each day for seven days 48 columns of ten figures each to add, in all 2,592 additions. These subjects were able on the second test to reduce the time 31% and the errors 29%, with a total improvement of 29%. Only fifty-three minutes' practice was actually given. Thorndike says of this test:

"That the practice represented by only 2,592 additions made by an educated adult whose addition associations have been long established and often used should produce an improvement of three-tenths bears witness to the continued plasticity and educability of the synapses involved."

In another connection he has stated (127, 290):

"So apparently simple an ability as ordinary addition of integers can be shown to require analysis into at least nine separate abilities, each of which probably requires further analysis, in one case, into perhaps ninety component ability-atoms."

Similarly, Donovan and Thorndike (128, 134) used 29 fourth-grade pupils and found in a practice series, given two periods of two minutes each per day for three school weeks, or a total of thirty two-minute periods, the average rose from 2¾ to 4½ examples per minute. Kirby (65, 24) studied experimentally 732 children in the fourth grade, testing them before and after sixty minutes of practice, after the method just mentioned. He found the average score changed from 31 columns with 24 correct per minute to 50 columns with 37 correct. The children, therefore, gained 61% in attempts and 54% in correct additions, and maintained the same rate in their accuracy and in their speed, almost. Hahn (128, 134) has obtained similar results. Kirby also gave a series of drills for fifty minutes to 606 third and fourth grade children. At the beginning the children averaged 40 simple divisions per minute, with 37 correct, an accuracy of almost 93%. At the close of the drill series they performed 73 divisions per minute with 70 correct, an accuracy of almost 97%. They had gained 83% in speed and almost 90% in their accurate results. At McLean Hospital, Wells found that ten nurses, five men and five women, in oral addition of digits printed one above the other, in five weeks, practicing five minutes per day, six days in the week,—a total of 150 minutes of practice, increased their speed nearly 100% and maintained about the same rate of gain in accurate work. The five women on the first day performed 1,115 additions in five minutes, while the five men reached 1,120. On the thirtieth day the women aggregated 2,210, and the men 2,178 additions. The lowest score at first was made by a woman who got 150, and at the end she reached 280. The highest at first was by a man who got 290 and on the thirtieth day he went to 540. It is observed that the lowest and the highest made practically the same rate of gain. Whitley (134, 129) tested nine subjects in mental multiplication, giving a practice series of three examples per day for twenty days, omitting Sundays. These subjects averaged 2.8 minutes practice per day, or a total of fifty-six minutes. The results show more than 100% gain in speed, with no ill effect upon accuracy.

In the Dumfries schools, Jeffrey (61, 392) selected 9 boys and 9 girls, and placed them in three groups according to their mental ability, as disclosed in previous school work.

Each group consisted of three boys and three girls, the groups being classified as bright, average and dull. They were all given fifteen-minute drills for five consecutive days and then were tested with the following results: The 9 boys made 19,717 additions and the 9 girls made 18,304, with 126 errors by the boys and 134 errors by the girls. The group results were: bright boys gained from first to second day, 49.1%, girls, 32.7%; average boys, 28.2%, girls, 32.3%; dull boys, 25.7%; girls, 44.6%. From first to fifth day the gains were: bright boys, 90.9%, girls, 58.9%; average boys, 62.9%, girls, 67.2%; dull boys, 47.4%, girls, 91.1%.

Short and Long Periods of Drill.—Kirby tried the effect of dividing the total practice time into periods of different lengths. He used 1,338 children (65, 63) and his results have considerable pedagogic value. Using 100 as a standard of comparison his data may be expressed as follows: Gains made with 22-minute practice periods, 100; 15-minute periods, 121; 6-minute periods, 101; 2-minute periods, 146.5. These were in addition. The results in division were: from 20-minute periods taken as a basis, 100; 10-minute periods, 110.5; 2-minute periods, 177. That is, the short periods of practice scattered over more days give a higher rate of gain. These are subject, however, to discount since the children during the longer time elapsing from the first to the last test would gain more from their regular work than those taking the longer single periods of practice. In the Whitley tests already referred to it should be noted that after twenty days, with practice upon only three examples each day, the subjects were able to reduce the time from 338 seconds, with 1.7 errors per example to 135 seconds with 1.4 errors per example. Thorndike drilled sixteen subjects continuously on sixty examples, the number used by Whitley, but employing only one period of practice, varying from 2 to 12 hours. His adult subjects took an average of 352 seconds per example with 1.2 errors on the first test, and 160 seconds with 0.8 errors on their final test. Their total time of practice averaged higher than did those tested by Whitley, while their gain was not so marked. However, it is to be noted that Thorndike's subjects took their final test at the close of three or four hours of unrelenting practice, and some allowance is to be made for their jaded condition.

Permanency of Improvement through Drill.—Wells tested for the permanence of improvement in the adult nurses who had taken the drill from January to April, 1910, giving six of them two tests in December, 1912, after a lapse of 2 years and 8 months (128, 323). In January, 1910, they had

averaged 234 additions in their first test and 274 on the second, while their average score in the final test in April, 1910, had been 447. In December, 1912, these same adults on their first test scored 343 additions and the next day raised it to 375. Kirby (65, 71ff) tested 258 of his fourth-grade children from three to twelve weeks after they had relinquished their practice and found them able to do as well as they had done on their previous final tests. He again submitted 152 of them to tests in September, at the opening of school after the summer vacation, and they showed a decided loss in speed with some decrease in accuracy. Prac-

TABLE A

TWENTY LEADING "TYPE-ERRORS," MADE BY TWO HUNDRED AND THIRTY-EIGHT CHILDREN IN ADDITION OF DIGITS, ARRANGED IN ORDER OF FREQUENCY. COMPILED FROM PHELPS (92)

Rank	Combination	Total number of errors	Percentage of the attempts	Number of children making the error	Percentage of the children making the error	Number of children making the error more than once	Percentage of children making the error two or more times
1	9 plus 7	395	3.32	120	50.42	63	26.47
2	8 plus 5	369	3.10	109	45.80	59	24.79
3	9 plus 6	320	2.69	94	39.49	49	20.59
4	9 plus 3	304	2.55	91	38.23	47	19.75
5	9 plus 5	298	2.50	86	36.13	38	15.96
6	9 plus 8	145	2.44	79	33.19	37	15.55
7	8 plus 4	142	2.38	79	33.19	33	13.86
8	8 plus 7	137	2.30	74	31.09	32	13.44
9	6 plus 5	135	2.27	72	30.25	31	13.02
10	7 plus 5	134	2.25	71	29.83	31	13.02
11	7 plus 3	120	2.02	67	28.15	26	10.92
12	8 plus 8	118	1.98	67	28.15	25	10.50
13	7 plus 4	232	1.95	60	25.21	25	10.50
14	8 plus 3	231	1.94	59	24.79	24	10.08
15	7 plus 6	186	1.56	58	24.37	23	9.66
16	3 plus 3	87	1.46	52	21.85	21	8.82
17	7 plus 2	158	1.33	52	21.85	21	8.82
18	5 plus 3	78	1.31	48	20.17	20	8.40
19	6 plus 3	71	1.19	48	20.17	17	7.14
20	9 plus 2	71	1.19	44	18.48	15	6.30

tice drills of fifteen to forty-five minutes were sufficient to restore the speed of the former tests. Brown (13) tested his practice school class, already discussed, after the summer vacation of twelve weeks and found that the drilled section in September was able to raise the averages made in June, while the undrilled section either showed no gain or had retrograded.

Type-Errors.—Phelps (92) reviews the Otis-Davidson tests upon 270 children in the eighth grade and uses their data in the study of errors. These tests were given in the grammar school at San Jose, Cal., and 238 sets of papers, 5,950 separate tests, were obtained. In Table A I have arranged the chief mistakes in addition in the order of their frequency.

There is a remarkably consistent showing in the table,—the combinations, which were the more difficult as shown by the number of times they occur, are also those which are made by the largest number of children and are more often repeated by the same child than the other combinations. Of the eight schools reported, those showing the highest speed had the lowest percentage of accuracy.

Phillips (95, 245), out of 440 returns made to him, gives the following list of difficult combinations of the digits in addition: 157 find 9 plus 7 the hardest; 88, 7 plus 8; 34, 6 plus 7; 42 find 7 alone troublesome; 18, 9 only; 26 are bothered in using 3, 6, and 8; 327 mention 7, and 204 give 9 in the list of digits they find hard to handle correctly.

In 1905 in Budapest, Ranschburg (97) tested 153 children, to whom he gave 65 tests, 20 each in Addition and Subtraction, 15 in Multiplication, and 10 in Division, in an attempt to determine which fundamental operation is the most difficult to school children. If we consider accuracy alone, his order, placing the easiest first, is: Addition, Multiplication, Subtraction and Division; but if they are arranged according to speed they are: Multiplication, Addition, Division and Subtraction. If both speed and accuracy be combined the order is: Multiplication, 68.75%; Addition, 60.25%; Division, 50.65%; and Subtraction, 46.82%.

Manner of Adding.—Arnett (5, 327ff) tested eight adults in their habits of adding, using 15 columns of 27 figures each. He had them add for thirty minutes, rest a few minutes and then add for thirty minutes more. Nearly 200 columns were added. It was found that some of the subjects employed straight addition, following the columns and making as many additions as there were intervals between figures, while others used combinations of digits. Out of a possible

use of 840 combinations one announced 840 results, while another gave only 519 results for a possible 810, having made 171 combinations of two figures and 43 combinations of three figures each.

Cole gave three tests to 35 persons selected at random to determine their habits of adding upward and downward. The first test consisted of 20 columns of 40 figures each, the subjects adding the odd columns upward and the even ones downward. The downward adding required 15.3% more time than the upward adding, but there were fewer errors in it,—54% of the errors being made in the upward and 46% in the downward adding. The second test consisted of 10 columns, identical for the upward and the downward adding, and a third tested the reading of numbers from left to right and from right to left in a horizontal line. It was found that the established habit of adding upward gave more speed but resulted in greater liability to error. In the reading of numbers the average time from left to right was 34.4 seconds with 62 errors, while the reading to the left averaged 37.1 seconds with a total of 36 errors. The usual reading habit afforded greater speed to the right, but the additional attention that was demanded in the reversed reading resulted in a higher accuracy (23, 83ff).

Socialization of Arithmetic.—Paine reports a recent experiment in Boston with some sixth-grade children who were slow and indolent in Arithmetic, but not mentally defective. They were chronic "failers" and were particularly deficient in Arithmetic. A "grocery store" was fitted out for them with enough of the real supplies to make the experiment more than symbolic. It was found that the children took on new life not only in Arithmetic but in their Language work as well. The results in Arithmetic are given as follows:

1. Increased accuracy and speed in computations.
2. Confidence was established in independent solution of problems.
3. A good drill was afforded in making up original problems.
4. Some valuable training was gained in business methods.

Dooley (37) also reports some interesting work in the successful motivation of Arithmetic in the Massachusetts Industrial School.

The Wording of Problems.—The effect upon results occasioned by a change in the wording of problems is reported by Phillips (95, 268) in the case of 224 teachers or those preparing to teach. When 40 problems involving Gain or

Loss, expressed in common fractions, was given them 81.6% of them solved all correctly while the others averaged 5 problems missed. Later the same problems were given to 212 of the same group, with a change only in the wording from fractions to per cent and 62% solved all correctly, while the others averaged 3 missed. During the past year Courtis (31, 4) turned his attention to the question of the wording of problems. He was able to construct twenty-one varieties of problems, based upon a single situation, by changing the form of the question and the relative position of the phrases employed, and his tests showed that one of these problems, measured by the errors made by children in solving them, was nineteen times as difficult as another. That the mere rearrangement of the words and phrases in problems causes such wide difference in results should have careful consideration from both authors of Arithmetics and teachers of that subject.

Correlation of Abilities in Arithmetic.—Lobsien (73) concludes upon some experimental studies of arithmetical abilities with the following:

1. There is no correlation between ability to remember number images visually and the ability to write numbers.
2. The greater the ability for solving problems in the head, the weaker is the memory of numbers gained through the eye.
3. The highest correlation exists between acoustic number-memory and ability to write numbers.
4. The good head-reckoner generally performs written work well, and *vice versa.*
5. Acoustic memory of numbers and ability to perform operations well have a smaller correlation.

Stone (117, 43) believes that ability in any fundamental, with the exception of Addition, implies ability in an equal degree in the other fundamentals, nearly, and he found that many factors influence individual abilities. In the extensive tests in the New York City schools, Courtis reports (30, 79) that speed and accuracy have no correlation and (p. 84) "it was found that a child with good reasoning ability did not make mistakes in the abstract work." So far as his analysis of the results goes, accuracy is dependent upon reasoning and simple reasoning is directly related to ability in abstract work, high scores in "test 6" (a simple reasoning test) being associated with high scores in "test 7" (a test in the fundamentals).

Up to a certain critical point there appears to be a definite correlation between a good knowledge of the tables and ability to work speedily in the abstract examples, and a lower corre-

lation with accuracy. The curves given by Courtis for the 13,629 boys and the 13,542 girls agree quite closely. The evidence which he submits warrants the deduction that, in general, a knowledge of the tables makes for speed and accuracy up to a certain point, beyond which other factors play such an important part that further knowledge is of no benefit (92-96).

Winch (137) tested four schools in 1909 and one in 1910 in London, and reports his findings on this question, as the writer has gathered them together, as follows:

TABLE B

CORRELATION TESTS IN LONDON SCHOOLS

Tests	Grade	Number of pupils	Average age	Correlation between accuracy and reasoning	Effect of practice
1	7 and 8	32 girls	13	.68	Improvement. No "transfer" was observed
2	3	43 girls	10	.79	Accuracy gained
3	4	38 girls	10.5	.69	21% gain in accuracy
4	4	35 boys	10	.85	20% gain in accuracy
5	4	72 boys	10.25	.736	40% gain in accuracy

From his series of tests it appears that he found accuracy in computation to accompany good reasoning ability, but improvement in computation did not affect perceptibly accuracy in reasoning. Starch (114, 310) gave special attention to the question of transfer of training in his investigations, and concludes:

"The improvement in the end was due to the identical elements acquired in the training series and directly utilized in the other arithmetical operations."

Comparison of Adults and Children.—Freeman (40a) sought in some experiments with 14 adults and 14 children, ranging in age between 6 and 14 years, to determine, if possible, how children differ from adults in the elementary scope of attention, and also what differences there are in the number of objects which may be grasped in a single act of attention by adults and children. He used spots of light thrown upon a screen as stimuli, and varied the time exposure from .018 to .040 of a second for the adults to more than a second for some of the children. He found the range of attention

of adults and children to be nearer together than is generally supposed (p. 309). In adults he thinks the range may average 6, although his observers varied from 4 to 7, while children between 12 and 14 years of age will average 5 and younger children, 4 (p. 309). He gave 1,806 exposures to his adults, while Nanu gave only 100, and he also figured out very carefully the optimum distance at which to place his observers from the screen. For these reasons he thinks his results are better. Nanu found with her observers a decided tendency to underestimate the number of spots shown; only 1 of her 5 observers overestimated the number, while 11 of the 14 sitting for Freeman overestimated them. He reports one pure analytic type, four mixed types with strong analytic inclination, two mixed with inclination to the synthetic type, and seven of the pure mixed variety. He differs strikingly from the findings of Nanu, who reported that she found the synthetic thinkers always inclined to underestimate the numbers and the analytic type to overestimate them. Of Freeman's observers, the three who underestimated the numbers showed no tendency toward synthetic thinking, and the two who were at all inclined to synthesis overestimated the spots, —one in 94% of the erroneous judgments, and the other in 86% of the cases,—while four of the five who gave evidence of analytic thought underestimated them.

Some of the introspections seemed to show that the observers could image the groups of objects and describe them without having a grasp of the correct number, and he concludes that the number name is not essential to a comprehension of a group of objects. "Neither the word nor the name is necessary for the number-concept."

In his experiments with children he found less satisfactory results, as they were unable to give reliable introspections and only a small number of children of any age was used. Of the 14, two were 6 years of age; two were 7; two were 8; two were 10; four, 12; one, 13; and one, 14. As these were scattered through six of the eight grades, with no representative in the fourth and sixth grades, it gives small results for each grade. These children had been taught numbers upon the Russian reckoning-machine, so they were not entirely in new experiences. He found it necessary to exclude from his final results the four younger children's reactions, as they were unreliable. Of the remaining 10, he made two groups of 5 each according to ages. The 5 children between 8 and 10 years of age showed marked differences from the 5 who were 12 to 14 years old, while the older group resembled very much the adults, both in range of attention and in its behavior.

As a general result of his experiments Freeman concludes that:

(1) Children as a rule comprehend a number of objects less correctly than adults.
(2) Children prefer a horizontal arrangement of objects to be seen.
(3) Children show a more rapid decline in correct answers as the number of objects is increased.
(4) The range of attention in children is from 1 to 2 less than in adults.
(5) Children underestimate more frequently than adults.
(6) Definite arrangements in groups is less favorable for children than for adults.
(7) Attention in young children is very irregular.
(8) No correlation was found between school-talents and correct answers.
(9) Groups of 5 were better for the children and groups of 4 for adults. This last finding agrees with the contention of Lay that the quadrate form is the best; but Freeman finds it only true for adults, rather than for school-children.

It must be confessed that we do not yet have adequate results to justify any conclusions upon the perception of simultaneously presented objects as a basis for early number training. Too few observers have been used so far.

From such experiments as those of Freeman, one may be led to infer that the basis for the difficulties encountered by children and adults in mastering the multiplication table lies in the inability to handle numbers in groups of more than 5 or 6 readily. To master the table of 7's or 8's or 9's, one has to group the numbers in bundles of 7, or 8 or 9. The pupil usually finds the numbers below 6 rather easy in comparison with numbers between 6 and 10. To say the 9's, one has to group the numbers up to 90 in bunches of 9's, and the attention has to pass rapidly over the groups if the learner is at all visually minded.

Individual Differences.—There is to be seen from the various experiments reported a very wide divergence in number ability among school children. These differences are shown in the aversion of some to the subject as a school topic, while others choose it as their favorite branch. This is often caused by wrong motivation at some previous time, or to attitudes of parents toward the subject, or to poor teaching in a lower grade, in the case of those who dislike it; and to home encouragement, proper motivation, or good teaching, or per-

haps, to all these influences combined in the case of those who prefer it. Frequently, it has been found that differences in habits of thinking cause variations in school interest in Arithmetic. No doubt, the varying degrees of interest may sometimes lie far back of school experience, in the child's opportunities to satisfy his inclinations for number in the nursery. Provisions that are made for the natural growth in number in young children in various materials afforded in the home, coupled with an active interest on the part of the mother, often determines the future bent of the child. While no other subject has been as much taught in the modern school, it is equally true that in no other subject has there been so much bad teaching. So to-day, partly through imperfect teaching and a variety of pre-school inclinations, we find in the school grades children of almost every degree of advancement in the same grade. Some in the first or second grades have as good ability in numbers as others in the sixth, seventh, or eighth grades.

Sex Differences.—In addition to the effect of puberty already cited from Voigt, a number of observations have been recorded upon the differences in arithmetical abilities dependent upon sex. Ballard (9, 18) says that in a series of tests in the London schools the girls showed better mechanical skill in the solutions, but the boys did the problems better, and "on the whole the boys were considerably ahead of the girls." Phillips (93, 163) tested 69 pupils in the Granite Falls, Minn., schools from March to May, 1912, and found in the progress made in drill work that "the girls did better than the boys in tests in fundamentals" and the boys "did better work in reasoning," while the boys made a greater gain between the tests than did the girls, their gain being about 24% over that of the girls. In his extensive tests in New York City, Courtis (30, 136) found also that "the girls exceeded the boys in the speed tests in multiplication, but they fell below them in accuracy in reasoning." From a comparison of all the scores made by the boys and the girls it is seen that the girls excel the boys in mechanical work in the fundamentals and the boys excel in simple reasoning. He concludes: "Differences between the abilities there undoubtedly are, but whether due to sex or to environmental influences the differences are too slight to be of any significance so far as present knowledge goes." Smith (109) reports on 3,869 students tested in the Normal School at Cortlandt, N. Y., as follows:

Of 1,265 men put on examination, 58.7% passed with an average of 84.1%.

Of 2,603 women put on examination, 50.6% passed with an average of 83.4%.
He also gives the records of 1,462 men and 1,564 women at Ypsilanti, Mich., which show practically no distinctions are to be made in Arithmetic on account of sex.

The Rice Tests.—In the autumn of 1902, Dr. J. M. Rice gave a test of eight problems to 6,000 school children in seven cities (98, 100). The children were chosen from grades four to eight inclusive. In all, 18 schools, some in the slum districts, some in the better districts and some in aristocratic neighborhoods, were included. He studied the effect of home environment, size of classes, total time per day given to Arithmetic, average age of pupils, forenoon and afternoon periods of recitation, methods of instruction, teaching ability of the instructors, and concluded that none of these was the determining factor in securing good results in the subject. Rather surprisingly he puts the whole responsibility ultimately upon the supervision. "This means (p. 136) in other words that the controlling factor in the accomplishment of results is to be found in the systems of examinations employed, some systems leading to better results than others." He found wide variations in the upper grades, mechanical errors increasing in them, with a decided deterioration in the 5th and 6th grades. Cities usually ranked with their individual schools; that is, good work in one school usually signified good work throughout the whole city.

The Stone Tests.—Dr. C. W. Stone (117) gives detailed data from 26 school systems scattered well over the United States and comprising tests in Arithmetic which he personally gave to 152 classes of pupils in the 6A grade. Of the systems tested, 6 were located in New England, 11 in the Middle East, and 9 in the Middle West. The tests were given under controlled conditions, and covered the fundamental operations and the children's ability to reason upon the solutions. With 6,000 sets of papers to study he draws the following conclusions:

1. The net result of arithmetic work in the first six years is *several products,* rather than *a* product. The study called Arithmetic makes demand upon a plurality of abilities (p. 43).
2. There is a great variability in the products of different systems, and greater still among individuals in any system. The variability among boys does not appreciably differ from that among girls.

3. The possession of a certain amount of ability by a system is a better guarantee of the same amount of another ability than the possession of a certain amount of ability by an individual is that he will have the same amount of another ability.

He agrees with Rice upon the effect of good supervision, but found different results on the tests in reasoning (p. 45). He had the courses in Arithmetic in these 26 systems rated for him by 21 professors and graduate students in education (p. 71) and compares the results of his tests with these ratings. He says:

"The situation seems to be that the course of study is not at present the factor that it ought to be in producing abilities. In certain systems it is evidently working well, but in others there is a wide-spread disparagement between excellence in abilities and excellence in the course of study." "The course of study may be the most important single factor but it does not produce abilities unless taught. The other essential features for successful teaching are teachers and children of usual abilities, a reasonable time allotment, intelligent supervision and adequate measurement of results by tests (p. 91).

The Courtis Standard Tests.—Following immediately upon the results obtained by Stone, Dr. S. A. Courtis began by giving the Stone tests to 317 girls in the Liggett school at Detroit, in 1908 and 1909. These girls were scattered through the grades from the 3rd to the 13th. Using his results as a basis, in September, 1909, he devised a new set of tests covering speed in each of the four fundamental operations, one in copying figures, two in reasoning and one general test in all four fundamentals. Under controlled conditions these were given to the same school in September, 1909, and in June, 1910. Among other results he found as did Rice that the 6th grade was a "notoriously difficult" one, although it had ranked high as a 5th grade the previous year (29, p. 361).

From this beginning, Courtis came to believe that a uniform standard test could be devised, so he sought during the school year, 1910-11, to establish such a standard. He gathered papers from near 9,000 children in from 60 to 70 schools scattered in 10 states. These children had been given his 8 tests and a "standard" table was constructed from the results, which is given here after corrections have been made in it from later facts gathered altogether from 66,837 children and revised to August, 1913.

From Table C it will be seen that a 6th grade child should be able to give correctly 50 combinations in addition of digits, 38 in subtraction, 37 in multiplication and division,

and copy figures at the rate of 92 per minute. The scores from grades 3 to 8 inclusive are revised to suit the figures from 66,837 tests, while the others, I understand, are those made out from the first studies gathered from 19 cities.

TABLE C

COURTIS STANDARD SCORES, SHOWING WHAT A CHILD IN EACH GRADE SHOULD BE ABLE TO ACCOMPLISH IN ONE MINUTE

Grade	Number of simple additions	Number of simple subtractions	Number of simple multiplications	Number of simple divisions	Number of figures copied
1	(6)	(6)	.....	.....	(29)
2	(21)	(12)	(10)	(12)	(51)
3	26	19	16	16	63
4	34	25	23	23	75
5	42	31	30	30	84
6	50	38	37	37	92
7	58	44	41	44	100
8	63	49	45	49	108
9	(65)	(50)	(50)	(50)	(120)
10	(57)	(45)	(43)	(46)	(112)
11	(59)	(47)	(44)	(48)	(114)
12	(61)	(48)	(44)	(49)	(112)
13	(71)	(56)	(50)	(56)	(116)
14	(74)	(51)	(58)	(59)	(124)

The New York City Tests.—From March 15 to April 26, 1912, Courtis applied his tests in New York City to a list of 33,350 pupils, representing a school register of 40,000 pupils, or about one-tenth of the city school population from the 4th up to the 8th grade. Representative schools were selected in various parts of the city; 21 schools furnishing 380 classes with 12,147 pupils, were in Manhattan borough; 9 schools, with 148 classes and 4,488 pupils, were in the Bronx; 18 schools, with 315 classes and 10,243 pupils, were in Brooklyn; 2 schools with 23 classes and 646 pupils were in Richmond borough; and 2 schools with 37 classes and 1,145 pupils in Queens. From these, 28,669 complete returns were received, but only 27,171 were tabulated because of apparent irregularities in the remainder. Courtis went to New York and personally took charge of the tests at the request of the " Hanus Committee in Charge of Educational

Aspects of School Inquiry." His purpose was to determine, if possible, the following:

1. The standard of achievement in fundamental operations with whole numbers, and in simple reasoning.
2. The relative achievement of the schools tested, as measured by standards.
3. The relative achievement of grades and individuals, as measured by standards, so far as is necessary to indicate to teachers, principals, and superintendents how such knowledge could be used to make their work more efficient.
4. The relative achievement of New York City schools as a whole, as measured by standards derived from tests in other cities.

In the following table will be given the score of the various grades in each one of the eight tests used and at the same time the highest score made by any pupil, with some other data that may assist in one's understanding the gross results of the experimental study. It is not possible for us to enter upon any comprehensive consideration of the minor details reported by Courtis in his 158-page booklet. A few findings have already been mentioned and a few others remain to be noted after the table is studied.

TABLE D

CORRECT SCORE AVERAGES MADE BY THE DIFFERENT GRADES IN THE NEW YORK CITY SCHOOLS

Grades tested			4th	5th	6th	7th	8th	9th	10th	11th	12th
Number of pupils in each			5396	5386	5670	4771	4502	440	257	179	120
Average age of the pupils			10.5	11.3	12.4	13.9	14.6				
No.	Kind of test	Max. Score									
1	Addition,—speed	125	41.9	50.2	56.9	62.2	69.5	71.6	71.7	73.9	74.2
2	Subtraction,—speed	125	29.5	36.8	41	45.8	52.2	52.2	55.3	55.2	54.1
3	Multiplication,—speed	125	28.7	35	38.3	40.9	45.8	46.5	46.8	48.6	46.6
4	Division,—speed	125	26.6	34.7	39.7	44.6	50.9	52.5	52.7	54.2	55
5	Copying figures,—speed	205	75.4	85.5	92.5	100	106.8	98.8	104.5	109.4	105.6
6	Reasoning,—one step	16	1.8	2.3	3	3.7	4.4	5.1	5.1	5.1	5.7
7	Fundamentals	19	4.2	5.8	7	8.5	10.1	10.9	11.5	10.5	11
8	Reasoning,—two steps	8	.7	.9	1.3	1.7	2.1	2.5	2.6	2.7	2.7

It must be borne in mind that the Courtis tests are exactly the same for all the grades and that he holds that a score of forty answers per minute means double the ability that gives only twenty per minute (p. 17), and to change from 20 to 25 answers corresponds to a change from 40 to 45 per minute. The errors that were shown in the papers he classifies as follows:

1. Carelessness in bringing down the wrong figure in division or placing partial products in multiplication under the wrong figure, 12.5%.
2. Copying incorrectly, reversing figures, as 639 for 693, 8%.
3. In fundamental combinations, 50%.
4. Scattered, such as errors in carrying, etc., all the rest.

Many errors were found in handling zero. It is worthy of mention here that in Columbia University, in the summer of 1910, 41 adult graduate students, teachers and superintendents were tested and 18 made 104 mistakes in zero combinations particularly when zero occurred in the multiplier.

He found in the New York schools, as has been found wherever tests have been applied, that the work in fundamentals is very low both in speed and in accuracy in computation and simple reasoning. The critical period for the mastery of these fundamentals seems to lie down in the lower grades. In the introduction to the Courtis Report, Dr. Hanus calls attention to the low degree of efficiency in the schools and says: "Children of every level of ability are found in every grade and differences between individuals greatly exceed the difference between grades." For this reason the fundamentals should be adapted to the individuals and they should be taught in the light of individual capabilities. "This condition is universal and is not due to lack of effort or other conditions that could be easily removed, but to a neglect of one basic factor,—the difference in the powers and capabilities of children," (p. 76), because children are already at school entrance highly specialized in their mental habits. Courtis thinks (p. 130) that a more simple and practical course in Arithmetic, based directly upon the social needs of the children, would influence for good a greater number of both children and teachers.

The Boston Tests.—The same eight tests were given by Courtis to 29 of the schools in Boston, in October, 1912, and again in March, 1913. More than 500 classes and about 25,000 children were included. These tests were designed to determine the following facts:

1. The standard of arithmetical work in the Boston schools, and their comparative standing with other schools already tested.
2. The nature and degree of change produced by six months regular work in Arithmetic.
3. The effect of certain special methods of individual instruction.

Supt. Dyer devotes only thirteen pages of his recent report (38) to these tests, yet some valuable facts are disclosed:

1. Boston is lower in abstract work and higher in reasoning than New York.
2. A comparison of the tests in March with those six months earlier shows that 53% of the pupils made improvement, 30% stood still and 17% lost.
3. Four special methods were employed in the experimental study:
   (a) In one group, each teacher took one period per week to work with individual pupils who seemed from the October tests to need particular strengthening upon certain points. This was continued for twelve weeks, and the group as a whole gained 14%.
   (b) A second group had the assistance of an able specialist, one to each school being assigned to the task of giving individual help to children sent by the regular teachers. This also ran for twelve weeks, and 2,187 children out of 3,443 received individual assistance, in 60,000 interviews lasting 15 minutes each. The report says this method did not yield the results expected.
   (c) A third group pursued regular work with no remedial help, and were used as a "control" group in measuring the others.
   (d) A fourth group was formed in March, of pupils who had not taken the October tests, and they were given special daily drills on the fundamentals for ten minutes each day during the regular recitation period. In the March tests this group attempted fewer problems and examples than the others and "this method was the least effective."

A comparison of the three drilled groups with the "control" group shows that:

1. Group one, in which the regular teachers devoted one period per week to a class drill upon fundamentals, exceeded the "control" group by 8% in accuracy.

2. Group two, in which a special teacher gave individual help, exceeded it by 5%.
3. Group four, in which the ten-minute drill upon fundamentals preceded the test, exceeded it by only 3%.

These facts seem to emphasize the value of systematic work under the regular teacher and to discount the common practice of "cramming" for tests and examinations.

Personal Observation of the Recent Boston Tests.—On Thursday, January 8, 1914, the writer went to Boston to observe the giving of the new Courtis tests which were to be given to more than 20,000 children, beginning that day under the supervision of Miss Rose A. Carrigan, of the Boston Normal School. Three schools were selected, one mixed and one each in which the boys and girls are taught separately. Miss Carrigan had furnished me a list of all the schools to be tested each day, so I went on Thursday without her knowledge to schools of my own selection. In all, I saw the tests given to 8 rooms, 5th, 6th, and 7th grades, 350 children being present and taking the tests. I saw 15 of the young lady "cadets" doing the testing at the three schools, two working together in each room. One would explain the signals to be observed while her assistant manipulated the signal-box and announced the time to start and quit. There was splendid management in handling the tests and I have no criticism to offer on the fairness of the application of the tests. The children seemed to enjoy the game and so far as I could see took no notice of my presence or that of the master who accompanied me to their room. 53 cadets were busy in these tests after being trained by Miss Carrigan for three days. Another test was given the second week in April, 1914, but it will be several weeks before results can be known. These tests are to (1) set definite standards for each grade, (2) measure the results of each teacher's work, (3) assist in motivating the children's work, and (4) to furnish some studies in the grading.

Criticism of Standardization.—It is proper that I give some discussion upon the general proposition to attempt a "standardization" of the achievements in Arithmetic, which is, after all, only a subordinate notion of "standardization" in all studies. There appears a strong tendency to-day to try to standardize everything, products and producers alike, and educational circles seem to have been caught in the current. The trades are said to have a definite number of doors for a carpenter to hang in a day, or a specific product to be turned out, beyond which a good workman will not endeavor to go. With discriminating accuracy there are attempts to

"standardize" in this world-movement not only Arithmetic, but also penmanship, compositions, cattle, peanuts and parents!

Courtis has selected a certain line of level from the thousands who have been tested by his method and sets these levels up as a standard for the schools everywhere. This would not seem so serious did we not find him saying (31, 14):

"It should be noted that standards will *not* produce uniform products unless they are treated both as goals to be reached, and as limits not to be exceeded."

He points out that the average score, for instance, of 11,059 8th grade pupils on test No. 7 was 9.5 examples correctly done, but 38% of these pupils had been so overtrained that they exceeded this score by 10% to 100%. "These high scores of school children represent waste effort." "When standard ability has been attained, *additional* degrees of mechanical skill are products of the least importance."

While the writer is in complete sympathy with every attempt to place Pedagogy upon a sound and genuine scientific basis, he does not consent willingly to the effort to "Procrusteanize" the schools by requiring them to be measured and directed by semi-arbitrary standards. Abilities of children are too widely variant and future callings are too diverse for us to agree that each child in the great public school system shall be moulded into the same set form in Arithmetic, or, indeed, in any school subject, by accepting standards which are to be reached but not exceeded. The present movement is awakening much interest among the school public and must result in good. Its chief temptation lies in the extravagant application of some of its obviously useful features until the practical educator will be led to reject even what help it should be able to offer.

The selection of a semi-arbitrary standard in Arithmetic has gone no farther than the four fundamental operations and simple problems in reasoning, and has not approached fractions, denominate numbers, ratio, percentage, mensuration,—yet to me it seems much like taking the average per-acre corn crop of the country, or more correctly, of a few sections, and setting this up as a "standard" to be reached but not exceeded by farmers everywhere! Boys' Corn Clubs have shown the corn raisers the fallacy of taking "averages" as standards. It is a little similar in educational work. As land differs in fertility, so children differ in *Begabungen* or talents. As farmers differ in their methods of cultivation, so parents and teachers differ in *Erziehung*. We may have to leave the *Begabungen* with the biologist and the eugenist; but with more fertile methods of instruction, with a more socialized curriculum, it is possible for these experimental

studies to become " stepping-stones " upon which we may rise to higher things. At all events we should recognize and respect, nay more, develop and encourage the *individuality* in every child.

TABLE E

DISTRIBUTION OF ARITHMETICAL TOPICS IN THE GRADES IN AMERICAN CITIES*

All figures are to be read as percentages

Topic	Cities having it	1st grade	2nd grade	3rd grade	4th grade	5th grade	6th grade	7th grade	8th grade
Numbers introduced	all	71.5	22	6.5	..	..	..	..	..
Fundamentals completed	all	..	..	5	78	17	..	..	..
Common fractions begun	all	14	21	17	21	27	..	..	..
Fractions emphasized	all	..	..	2	10	63	23	2	..
Decimal fractions taught	all	..	..	..	9	32	40	13	6
Ratio	all	..	..	..	5	8	11	20	56
Percentage, general cases	all	..	..	..	5	30	45	20	..
Simple interest	all	..	..	..	..	5	20	45	30
Compound interest	64.7	..	..	..	..	..	5	40	55
Commission	all	..	..	..	..	..	15	55	30
Commercial discount	all	..	..	..	..	..	10	50	40
Bank discount	all	..	..	..	..	..	..	40	60
Exchange	42.8	..	..	..	..	..	..	23	77
Stocks and bonds	71.4	..	..	..	..	..	..	23	77
Partial payments	60.7	..	..	..	..	..	5	20	75
Partnership	57.1	..	..	..	..	..	..	28	72
Simple proportion	all	..	..	..	..	..	12	21	67
Compound proportion	42.8	..	..	..	..	..	..	24	76
Mensuration,—of plane figures	all	..	..	..	10	12	20	30	28
Mensuration,—of solids	all	..	..	..	..	12	18	25	45
Square root	all	..	..	..	..	..	..	15	85
Cube root	28.5	..	..	..	..	..	..	25	75
Factoring	all	..	..	..	12	33	25	18	12
Least common multiple	all	..	..	..	15	37	34	10	4
Greatest common divisor	all	..	..	..	12	37	37	10	4
Metric system	35.7	..	..	..	..	..	..	28	72

* In the above table the distribution of the topics is given for 28 American cities reporting to the American Committee of the International Commission on the Teaching of Mathematics, and published in the U. S. Bureau of Education Bulletin No. 13, 1911, pp. 16-65, 75-78. These cities represent about one-tenth of the scholastic population in the United States.

TABLE F

IMPORTANT FACTS ABOUT THE EXPERIMENTAL STUDIES IN ARITHMETIC

Investigator	Country	Subjects	Date*	Purpose of experiments
1. Phillips, D. E.	America	260 children	1897	Popularity of arithmetic
2. Lewis.....	England	8,000 "	1913	" "
3. Messenger....	America	6 adults	1903	Kinds of thinkers
4. Nanu.....	Germany	7 "	1904	" "
5. Freeman.....	"	14 " 14 children	1910	Differences in adults and children
6. Lobsien	"	.....	1913	Sex differences
7. Ballard.....	England	.....	1912	" "
8. Smith.....	America	3,869 adults	1895	" "
9. "	"	9,307 "	1895	" "
10. Phillips, F. M.	"	69 children	1913	" "
11. Courtis.....	"	27,171 "	1912	" "
12. Voigt.....	Germany	.....	1912	" "
13. Brown.....	America	51 children	1911	Effect of drill
14. "	"	222 "	1912	" "
15. Phillips, F. M.	"	69 "	1913	" "
16. Starch.....	"	15 adults	1911	" "
17. Thorndike....	"	33 "	1908	" "
18. "	"	19 "	1910	" "
19. Donovan and Thorndike...	"	29 children	1913	" "
20. Kirby.....	"	1,338 "	1912	" "
21. Hahn.....	"	192 "	1913	" "
22. Wells.....	"	10 adults	1910	" "
23. Whitley.....	"	9 "	1912	" "
24. Jeffrey.....	Scotland	18 children	1912	" "
25. Kirby.....	America	1,338 "	1912	Effect of long and short drills
26. Whitley.....	"	9 adults	1912	" " "
27. Thorndike....	"	16 "	1913	" " "
28. Wells.....	"	6 "	1912	Permanency of improvement
29. Kirby.....	"	258 children	1912	" "
30. Brown.....	"	51 "	1911	" "
31. Ranschburg ..	Hungary	153 "	1909	Relative difficulty of fundamentals
32. Phillips, D. E.	America	440 "	1897	Relative difficulty of fundamentals

* The dates given are those for the year in which the experiments were made when these were obtainable; otherwise, for the year when the results were published.

TABLE F—Continued

IMPORTANT FACTS ABOUT THE EXPERIMENTAL STUDIES IN ARITHMETIC

Investigator	Country	Subjects	Date*	Purpose of experiments
33. Phelps.....	"	270 "	1912	Relative difficulty of fundamentals
34. Cole.....	"	35 adults	1912	Adding upward and downward
35. Arnett.....	"	8 "	1905	Manner of adding
36. Paine.....	"	12 children	1913	Motivationthrough store-keeping
37. Phillips, D. E.	"	224 "	1897	Effect of change in wording
38. Courtis.....	"	317 "	1909	" " "
39. Winch.....	England	32 girls	1909	Correlation and transfer of abilities
40. "	"	43 "	1909	Correlation and transfer of abilities
41. "	"	38 "	1909	Correlation and transfer of abilities
42. "	"	35 boys	1910	Correlation and transfer of abilities
43. "	"	72 "	1910	Correlation and transfer of abilities
44. Rice.....	America	6,000 children	1902	Comparative results of schools
45. Stone.....	"	6,000 "	1908	Results of six years' work
46. Courtis.....	"	317 "	1909	Speed, accuracy and reasoning
47. "	"	9,000 "	1911	Standardization of aims
48. "	"	27,171 "	1912	Abilities as related to standards
49. "	"	25,000 "	1913	" " "
50. Carrigan.....	"	20,646 "	1914	" " "

* The dates given are those for the year in which the experiments were made when these were obtainable; otherwise, for the year when the results were published.

V. Discussion and Pedagogical Deductions

Several facts seem to stand out quite clearly in these experimental studies. Some of the more prominent ones are: (1), Inadequate results are now being obtained in Arithmetic in practically all schools; (2), Courses of study, judged by experts as superior, give no better results than those judged as inferior; (3), The better educated teachers are not having more success than the less educated ones; (4), Small expenditure of time devoted to drill upon fundamentals under optimal conditions gives surprising mechanical skill, which remains fairly permanent; (5), The paradoxical situation has received no adequate and satisfactory explanation up to the present time.

With painstaking care, Rice, in his pioneer investigations a decade ago, eliminated one by one the elements that he thought had any bearing upon the cause of such poor mastery of Arithmetic and finally left the burden upon the superintendent and the system of examinations employed in the schools. However, I believe he was far from the proper diagnosis. The whole trouble, when we come to the ultimate analysis of the case, lies in the failure of the pupils to comprehend what they pass over in Arithmetic,—they *lack an orderly association of the principles* of the subject, and *they do not have their fundamental and hierarchical systems of mathematical habits well established.* Bryan and Harter (16a, 360) tell us that "A man is organized in spots—or rather in some spots—far more than in others. This is true structurally and functionally." "Some habits are knit together in a hierarchy."

> "There are a certain number of habits which are elementary constituents of all the other habits within the hierarchy. There are habits of a higher order which, embracing the lower as elements, are themselves in turn elements of higher habits. A habit of any order, when thoroughly acquired, has physiological and, if conscious, psychological unity. The habits of lower order which are its elements tend to lose themselves in it, and it tends to lose itself in habits of higher order when it appears as an element therein."

Proficiency in Arithmetic rests pre-eminently upon a mastery of habits associated in hierarchical fashion. Here, perhaps more than in any other school subject, does a ready habitual response indicate efficiency, and as Horace Mann might say (52a, 236): "One former is worth a hundred reformers." With our new psychology we are needing a few new canons for Arithmetic. Bryan and Harter say (16a, 375):

> "Now the ability to take league steps . . . , in addition, . . . , plainly depends upon the acquisition of league-stepping habits. No possible proficiency and rapidity in elementary processes will serve. The learner must come to do with one stroke of attention what now requires half a dozen, and presently in one still more inclusive stroke, what now requires thirty-six. He must . . . acquire a system of habits corresponding to the system of tasks. When he has done this he is master of the situation in his field. . . . Finally, his whole array of habits is swiftly obedient to serve in the solution of new problems. Automatism is not genius, but it is the hands and feet of genius."

If these authors are right, then it is the first business of the teacher in Arithmetic to see that the right habits are formed from the beginning and that the fundamental habits which enter into higher ones later on shall be intelligently approached by the teacher. Certainly, no other branch of school work utilizes more the first habits in the formation

of those that follow. The child's first experience with numbers in school should be made to assist it in his next step and the earliest drills in addition should be the stepping-stones to higher functioning in the work that follows. One great fault has been that schools have sought to introduce children to the mastery of problems involving situations when the children should have been mechanizing the processes of the fundamentals. The preadolescent period in school is distinctively the psychological age for drills; it is not the period to demand either reasoning or imagination upon the part of children. Hall (52a, 313) says: "Puberty is the birthday of the imagination," and it is discouraging and wasteful to thrust verbal propositions upon young children, requiring them to wrestle with the interpretation of a complex situation, when they should be establishing a whole federation of hierarchies of mathematical habits, so that there will be both speed and accuracy in responses when there is need for them. We shall profit greatly if we return to the discarded oral Arithmetic, and give patient, systematic drills upon rapid adding, subtracting, multiplying and dividing, without pencil or crayon. Hundreds of examples should be announced orally by teachers in these four fundamentals, and the children taught to respond quickly. In this way the lower habits of association are formed. With proper drills there is every reason to believe that children in the sixth and seventh grades will far surpass the present status in those grades. These rapid elementary processes favor prompt fusion into the higher unitary processes, and are also favorable for prompt reactions when new emergencies arise. Since one's response to a situation depends partly upon the rate of mental and nervous processes, but "far more upon how much is included in each process," it will be seen how necessary it is to present only simple stimuli until they have been mastered. In almost any regular class in Arithmetic can be seen pupils who add, subtract, multiply and divide with great speed, while others are going along at moderate pace, and still others are laboriously struggling with the most elementary processes by means of objective helps, like the fingers. Perhaps, the rapid worker expends less energy and finishes in one-fourth the time, because his federation of habits has done his work for him, so to speak, while the other pupils have been going over the ground as if it were strange territory to them. The main habits to be drilled into the young arithmetician are: (1) rapid association of numbers in the four fundamental processes; (2) accuracy in computations; (3) alert and keen attention to statement of examples and problems; and (4) quick application of the proper process to new situations. Teachers should

be extremely careful to avoid arrested development in the lower order of habits,—so often seen in children in the public schools. By starting right, and establishing the lower habits well, it is easy to follow with the proper sequence of simple habits, on up into the organization of the higher groups, or hierarchies.

If I am right in placing the first burden of responsibility upon the individual teacher, there is to be an equal sharing with the authors of texts in Arithmetic. In no other subject in the curriculum does the structure of the text-book determine so largely the teacher's procedure as in Arithmetic. The majority of public school teachers follow closely the order of topics and the exact rules of treatment laid down in the book. Small change is ever made in any of the material presented. It is taken explicitly, and no adaptation is made to specific needs of classes or individual pupils.

It is also true that Arithmetic demands, more than other branches, an orderly association, not only of its fundamental facts, but even more emphatically, a related and orderly grouping of all the subsequent topics. It follows from these desiderata that the improvement in results in Arithmetic must begin far back in the treatment of the topics by the authors of series of texts for school use. We shall hardly have better accomplishments among pupils until our texts are built upon more psychological and pedagogical lines. The present books are characterized by unnecessary and indefensible separation of genetically related topics that are given to the children as wholly new and unrelated; and as a consequence the memory is overworked with rules, formulas and model solutions, and there is no systematic mastery of the topics, no orderly association of the principles involved, and no formation of definite habits of response. There should be ample drills provided in pure numbers for the first four grades at least, with emphasis upon the processes, and then a gradual development into the other topics in such a manner as to show the genetic growth and derivation of the later from the earlier topics.

VI. Suggested Norms For Text-Books

In order to bring together the best possible talent and experience for the making of texts in Arithmetic, there is needed the joint counsel of the business world to decide the most necessary topics to be included, of the pedagogist to tell what are the practical reactions of children in the school-room, and of the psychologist to follow out the latest suggestions of scientific discovery in the laws of mental behavior and growth.

Two prime questions are met in the preparation of the text-

book:—(1) What topics are to be included; and (2) how shall they be treated,—as dissociated from the child's experience for purely cultural purposes, or as topics which deal with situations within the range of the child's daily life? An examination of the Arithmetics used now discloses the persistence of some topics from the remote past, even despite the fact that the practical business world long ago discarded them or has modified them almost beyond recognition. Partnership with Time was inherited from the Hanseatic League, which made practical use of it, but it has remained in the books for generations after it has been of any service, as an example of the conservatism of tradition. One sees small reason for including in any text for general school use such topics or subtopics as the Vermont Rule in Partial Payments, or even Partial Payments itself, or Foreign Exchange, Troy Weight, Apothecaries' Weight, Surveyor's Measure, Brick Layers' Work, Plastering, Lumber Measure, etc., any more than to put in also Bakers' Rules, Tailoring, Livery, Tobacco Manufacturing, Stock Raising, Dress Making, and scores of other special lines in which arithmetical laws may be of great service. The Metric System has no place in the grades of our American schools. The entire school should not be compelled to study something that only a small percentage of the pupils will ever get to use in scientific work later. It may well be made a part of high-school mathematics when it is needed.

Without further negative discussion, the following topics are suggested as reasonable and adequate to the real needs of the public schools:

1. Numeration and Notation. Hindu and Roman both to be presented.
2. The Four Fundamental Operations, Subtraction by the Austrian and Division by the Italian method.
3. Tables of Denominate Numbers, to include U. S. Money, Long, Dry, Time, Liquid, Avoirdupois, Square, Cubic, and Circular Measures.
4. Five Secondary Topics,—all possessing the Ratio Idea.
   (a) Common Fractions,—approached from the side of Division.
   (b) Decimal Fractions,—presented as a special form of common fractions whose denominator is always some multiple of 10, the numerator alone being written and the denominator indicated by the position of the point.
   (c) Percentage,—presented as a special form of Decimals, with 100 as its denominator. Many practical problems touching such business lines as the majority of people come into contact with.
   (d) Ratio,—which is only a special form of writing a common fraction, placing a colon vertically between numerator and denominator instead of a horizontal line between them in the usual manner.
   (e) Proportion,—simply an equality of ratios.

5. Square and Cube Root.
6. Mensuration: A distinct and separate subject to be approached objectively, with real objects and figures.
   (a) Rectilinear Surfaces: rectangles, and triangles.
   (b) Solids: including prisms, pyramids, cylinders, cones and spheres.

Under these six divisions the essential topics in general have been presented. An appendix might easily be added to suit particular communities, but it seems poor economy for publishers and the public to have a burden of highly specialized problems in the general text-book. In the appendix rural communities could be provided with rural problems, and those confined to strictly factory communities with problems suitable to their practical needs. It is not to be overlooked that the first six grades especially are to be provided with many more examples for drill purposes than are ordinarily afforded now. The Germans have always outdistanced us in this feature of arithmetical work. Their plan of publishing *Hefte* which contain from twenty to one hundred and fifty pages of examples, and selling for three to twelve cents each, has much to commend itself to us. Hentschel's *Neue Rechenfibel,* for instance, contains 32 pages, 3,760 examples, and sold for 3¾ cents per copy. The French have issued many problem manuals for use in their schools, selecting much material from the official examination lists. We can improve this feature of our arithmetical work either by adding special appendices when it is desirable to have the examples and problems for drill in the same text with the development of the general theoretical side, and by the issuance of separate booklets of drill exercises in other instances.

Examples and Problems.—All arts and sciences have a right to their own technical nomenclature. Their terms, of necessity, must be more specialized than these terms are when used in the ordinary way. For this reason there seems to be a need of making a distinction between the exercises which deal only with pure numbers and those which apply numbers in stated situations. The writer believes it would be a great help if all text-books in Arithmetic would refer to all exercises in pure numbers as "Examples," and to all exercises in applied numbers as "Problems." Both oral and written exercises could be given under each one of these classes.

Algebra and Geometry—It will not appear radical now to advocate the introduction of some elements of Algebra and Geometry into the public school Arithmetic text. In handling numbers in the grammar grades the equation is of much ser-

vice. In mensuration especially it is necessary to appeal to Geometry, as little intelligent work can be done there without some knowledge of geometrical figures and facts. In German and French schools use of these subjects has been resorted to for many years to illuminate the processes in Arithmetic. It is not advisable to eliminate Arithmetic from the 7th and 8th grades in order to introduce separate texts in Algebra and Geometry. A gradual introduction of these principles may begin in the 5th and 6th grades, and proceed with some definite matter fused with the more specific arithmetical facts. There is also an evident need of continuing Arithmetic into, if indeed not entirely through, the high-school. All the tests so far made show a lamentable weakness in Arithmetic in the higher grades. Recently Stratton (118,336) has emphasized the need of sympathy between Arithmetic, and Geometry and Algebra. Too many teachers of secondary schools belittle Arithmetic, forgetting that the higher work depends upon it While the pupil has outgrown many of the minor problems he must still keep in close touch with arithmetical calculations in his more generalized mathematics. In 52 schools reporting to the American Committee of the International Commission on the Teaching of Mathematics, 19 introduce Algebra in the 7th and 8th grades as Algebra, and 3 have work in Geometry other than what is needed in mensuration. In the schools of Germany, Geometry is usually begun now in the 6th grade. Out of 23,351 departments reporting in England 1,383 chose Algebra as an elective. Geometry is taught in about one-fourth as many departments. It seems advisable to begin these two subjects early as companion subjects along with Arithmetic and continue Arithmetic into the high-school work. For this purpose the text-books should present all the necessary material.

VII. Some Suggested Norms For Teaching

The many comparative experimental studies that have been made clearly demonstrate the fact that good courses of study, good superintendence, and well-educated teachers with plenty of equipment do not insure fruitful results. The Macedonian cry comes today from a multitude of teachers. Dyer in his recent report to the Boston School Committee (38,11) says: "The immediate and most urgent need felt by teachers is fresh light upon the art of teaching." The writer has been in somewhat close touch with the rural schools in the Mississippi Valley for the past two decades and he knows this con-

dition that Dyer says exists in Boston is quite general,—this one continuous entreaty for assistance. We have had an affluence of theory and a poverty of serviceable help in actual practice. Arithmetical texts should not be laden with pedagogic instruction to teachers. They need to avail themselves of the privileges afforded in State and City Normal schools, in Educational Departments in State Universities, in Teachers' Associations and Institutes, in works on pedagogy, and in school journals in order to get the most help in methods of teaching. This does not lessen the value of good text-books, built upon clear, pedagogical lines. Teachers who can really teach Arithmetic,—and the other common school subjects,—with life, with delight, throwing around each recitation the best affective atmosphere so that every activity of pupil and teacher will be properly motivated, are today in great demand. Is not the dread of failure in school work the worst kind of failure?

Drill on Fundamentals.—Children enter school with some notion of number already formed, as has been shown. The teacher's early work with them should be intelligently based upon what they already know, and should keep in close touch with the child's mode of arriving at his first number-concepts. No book is needed. Abaci, splints, counters, and cards with large dots upon them may be used. Together with the presentation of sense-stimuli to be counted both simultaneously and in succession, the child soon may be taught the number-symbols. Many children know these before entering school and it is well for the teacher to lead gently the child's interests rather than to attempt to drive or force them. No child seems to be exclusively visual-minded, or solely auditory-minded, or totally motor-minded, but each child is all of them at once, and may learn one fact in one channel and another fact in another channel. So the primary teacher will avail herself of all the means at hand to give the concepts of number in the completest and happiest forms, partly by presentation, partly by counting, and many times through the child's own movements. As has been earlier pointed out, children delight to count, perhaps because they can do it. Like older people they, too, worship at the shrine of achievement! It is also wise to have them measure and compare objects for basic work, but it is learned foolishness and pedagogic folly to insist, either in texts in the lower grades or in teaching Arithmetic in the grades that every time one divides 27 by 9 that 27 is necessarily "measured by the 9 and is therefore concrete." When written work is introduced it is better to place the digits under each other instead of in equation form as is the

practice so generally in the first grade, since the future arrangement will be with figures under each other. Thus,

1	4	6	2	3	4	7	4	5	9	6	1	7	8	2	5	3	9
3	2	1	4	5	3	2	5	2	3	3	5	1	1	6	3	2	3
4	6	7	6	8	7	9	9	7	12	9	6	8	9	8	8	5	12

These are given merely as a suggestion on the *form* in which the very first written operations in addition should be expressed and no order of subject-matter is here attempted. The child should be given those forms and symbolic statements which he is to use first and new ones are to be brought in only as he needs them. Arithmetic should be adapted to the child and not vice-versa. It is best to use written subtraction in the Austrian form and written division in the long form by the Italian method. In all the four fundamental operations constant and consistent drill is required until the mechanical processes become habitual. If children are to be expert in handling numbers they should be thoroughly trained in the fundamentals before they come to the age of puberty. All the experimental studies warrant this conclusion. This appears to be the strategic time to emphasize work and drill with pure number, with examples, according to the definition set forth here.

Why Are Problems Harder Than Examples?—In examples the child has his processes clearly indicated for him in their statement. In problems, the case is very different. He has to "orient" himself arithmetically among words, words, words, which too frequently are scarcely within his comprehension. As was mentioned under the experimental studies, marked variations have been found in the difficulties of problems by a change of their wording. The pupil must know the meaning of all words used in the problem and also know the situation presented, and this demands that it deal with objects and situations familiar to the child. An intelligent and independent solution is possible only when the language employed is within his vocabulary and the situation within his experience.

Tables of Weights and Measures.—Early in the child's school experience the simpler measures, such as Long and Liquid Measures may be begun objectively, since most children at school entrance have a little knowledge of some of the units, such as foot, yard, gallon, pint, etc. All the tables should be approached as objectively as possible, so judgment may precede and strengthen memory. Longitude and Time is practical now only when the Standard Time belts are used.

If it is approached from the geographical side, with proper drill upon the earth's rotation, it will not be necessary to commit rules about "when both points are east" or "when one is east of the prime meridian and one is west," since the mind grasps the situation objectively.

Fractions, Percentage, and Ratio.—At school entrance most children know what is meant by ½, ⅓, and possibly, ¼. Up through the first four grades the common fractions are gradually employed as they are needed, but in the 5th grade they come in for fuller systematic treatment. Decimal fractions should follow a good understanding of common fractions, and should always be taught as a special form of common fractions, which themselves should be based upon Division. Any common fraction whose denominator is 10, or some multiple of 10, may be written as a decimal by simply writing its numerator and indicating its denominator by an agreed conventional use of the period for a decimal point. Percentage should be taught in very close relation to decimal fractions, since it is based upon the decimal whose denominator is *always* 100. If the genetic relation between common and decimal fractions, and between decimals and Percentage is clearly developed inductively these subjects will be vastly easier to teach and to learn than if they are taught as separate and unrelated subjects, as is so frequently done.

Solution of Problems.—The writer has found in teaching Arithmetic to several hundred Normal School students, the majority of whom had taught before entering his classes, three distinct hindrances to the intelligent solution of problems,—*Rules, Formulas, and Model Solutions.* If text-books give rules or formulas or model solutions, students of advanced experience even are inclined to lean heavily upon them. This would suggest alertness upon the part of teachers in the grades to make sure that children are proceeding intelligently and are thinking the relations in the solutions. When a problem is attacked, the first step should be to read it carefully and pick out all the things that are granted, and to learn next what is to be found. One set of solutions here will serve to exemplify what is meant and also to correct some erroneous ideas that are found still in considering problems in Percentage. Keeping in mind all that has been said on the origin and nature of Percentage and the procedure with problems in general, let us take this problem:—

"If some goods are sold at a profit of 12½%, for $1,012.50, what did they cost?"

Smith (105,74ff) in his latest book on Arithmetic uses this problem to show three erroneous methods of solution, and

decides that the way out of the difficulty lies in employing an algebraic symbol for the *cost*. He entirely overlooks the intimate relation between Percentage and Decimal Fractions and treats it as a distinct part of Arithmetic, and this is a common weakness of arithmetical texts. His erroneous solutions, so far as they are arithmetical, should extend to four and include his own! *Unnecessary* appeals to Algebra cannot be sustained. When it is needed to use algebraic or geometrical principles to economize time and energy or in heightening the lucidity of the solution, no objection will be raised, but when this is made necessary because of a lack of proper connection between arithmetical topics, then it is to be condemned. If the *Hundred-hundredths* base-idea is grasped in Percentage, Smith's reasoning will be seen to deal with some "straw" solutions. Coming back to the problem proposed for solution we shall first read it, and require that the facts granted, and the results asked for shall be clearly set forth before the solution proceeds and we have:

Granted	(1)	Selling price	= $1,012.50
	(2)	Gain per cent	= 12.5
Required	(3)	Cost	= what?
	(4)	100% + 12.5%	= 112.5%
Since	(5)	112.5% of the cost of the goods	= $1,012.50
Then	(6)	1% " " " " " "	= 9
And	(7)	100% " " " " " "	= 900
Hence	(8)	The cost of the goods	= $900

The words before the numbers of the equations are given merely to suggest the grouping of the facts of the problem, but are not necessary in the pupils' written work. Since the gain has been expressed in *per cent* in the problem, it is the most natural procedure to take 100% as the basis in the solution. When this fact is seen the rest of the work is self-evident. This is in perfect harmony with such solutions as the following:

1. Find three-eighths of 24. Shall we let 5/5 equal 24, and then reason ourselves into adopting an algebraic symbol before we can solve this? Evidently, since the cue has been suggested in the fractional part, *three-eighths*, the obvious plan is this:
Since 8/8 of 24 = 24; then, 1/8 of 24 = 3; and 3/8 of 24 = 9.

2. Find 37.5% of 24.
Since 100% of 24 = 24; then, 1% of 24 = .24; and 37.5% of 24 = 9.

3. 15 is 5/8 of what number?
Since 5/8 of a number = 15; then, 1/8 of it = 3; and 8/8 of it = 24.

4. 15 is 62.5% of what number?
Since 62.5% of a number = 15; then, 1% of it = .24; and 100% of it = 24.

This "unitary analysis" method grows directly out of the processes of common fractions, and is to be preferred to any method that is satisfied to get the "answer," and cares nothing about the relations of the separate steps in the work. The numbering of the steps has been found of some practical service in referring to the solutions, and is not an essential part of the work,—much as the pages of a book are numbered for convenience, but have no bearing upon the content of the book itself.

Inaccuracies.—Many text books and more teachers are careless in arithmetical statements. Each equation should be true within itself and should be as carefully expressed as accuracy demands. Arithmetic is nothing if it is not exact and accurate. One often finds the continued equation in books, somewhat like this: $6 \times 2 = 12 \div 4 = 3 \times 5 = 15$, in which the various members are not equal. The trouble arises in an attempt to put two or more separate steps into one statement. While the continued equation is *sometimes* true arithmetically, it is *never* correct grammatically. The equality sign is the principal verb, and the second member its object, which cannot properly serve both as the direct object of one verb and be the subject of the next principal verb! Many authors also continue to use such expressions as: "100% = $660," and "Let 100% = $660," entirely disregarding the fact that *per cent* always means *hundredths* and that, therefore, *100% can equal nothing but 1 or some expression reducible to unity.* To say "100% = $660 is to say that 1 = $660; and to "Let 100% = $660 is to let 1 = $660, which is too apparently false to need further mention. The % sign should not be treated as an unknown quantity in Algebra. Yet, this fundamental error in handling this simple matter has led to endless confusion in the treatment of Percentage in the public schools.

Sources of Error.—The mistakes commonly found in the work of pupils in solving problems have these sources: 1. Mistakes in reading the problem, (a) reversing figures, (b) not getting the meaning of the words, or (c) not understanding the situations involved, with what facts are granted and what is required; 2. Inability to decide upon the processes to be used; and 3. Errors in computation. Each one of these mistakes calls for a specific kind of drill for its rectification. Careful work in the lower grades can do much to avoid them in the later work of the children.

Abstract and Concrete Numbers.—It is the belief of the writer that much useless and wasteful philosophising is attempted in the treatment of numbers in the grade work. It

ought not to be regarded as sound pedagogy to try to force upon children the introspective and ratiocinative deductions of psychologists and philosophers about the nature of number. One may seek to discredit this position by calling it an appeal to the naive and *laissez faire,* but the suggestions have sufficient provocation. In his new book, Stamper (113, 29) would almost confuse a philosopher with such statements as:

"Number is necessarily abstract." "The term abstract number strictly speaking expresses a redundancy, for number is essentially abstract. . . . The abstract idea of number should be considered in multiplication and division problems. In multiplication, the multiplier is abstract, the multiplicand and product being concrete. . . . In division, the dividend is always concrete." (p. 30.)

One cannot withhold the conviction that Stamper, although supporting the counting psychosis as the origin of number, since he says (p. 29): "Number has its origin in the counting process," yields to McClellan and Dewey when they state (76, 137):

"The multiplicand must always represent a number of (primary) units of quantity (a measured quantity), and is commonly said to be concrete." "From the relation existing between multiplication and division, it is seen that in division the dividend,—or multiplicand as being a product of two factors,—always represents a measured quantity, *i. e.,* it is concrete; the divisor may denote either a concrete quantity or a pure number and the quotient is, of course, numerical in the one case and interpreted as concrete in the other."

This philosophical reasoning has played havoc in practical school work, since teachers have striven to foist it upon the children even in the lower grades. Allen well says (2,383):

"If the child sees that each of seven boys has 5 cents, and wants to know how many all have, he will have little doubt as to whether he is repeating "5 cents" "seven boys times," or "seven cents times" or just "seven times" and *he will need no rule about abstract multipliers.*"

In other words, the natural movement of mind in handling these number combinations is more certain and more direct, if left unhampered by philosophical considerations and artificial rules. Wark (131, 162) claims:

"The most elementary counting, even that stage when the counts were not carried in the mind, but merely in notches on a stick or by DeMorgan's stones in a pot, requires some thought; and the most advanced counting implies memory of things. *The terms, therefore, abstract and concrete number, have long since ceased to be used by thinking people.*"

Recently the writer visited an Arithmetic class in a State Normal and saw a group of practically adult students confused about this very question concerning abstract and concrete num-

bers, according to their previous training in the conventionalities of the text-book. Their teacher diverted the work of the hour and she and the class spent almost the whole period in re-establishing the requirements "that the product must always be the same kind of unit as the multiplicand," and "addends must all be alike to be added." This is not an exceptional case. Throughout the whole range of teaching Arithmetic in the public schools pupils are obfuscated by the philosophical encumbrances which have been imposed upon the simplest processes of numerical work. The time is surely ripe, now we are readjusting our ideas of the subject of Arithmetic, to revise some of these wasteful and disheartening practices. Algebra historically grew out of Arithmetic, yet it has not been laden with this distinction. No pupil in Algebra lets x equal the horses; he lets x equal the *number* of horses, and proceeds to drop the idea of horses out of his consideration. He multiplies, divides, and extracts the root of the *number,* sometimes handling fractions in the process, and finally interprets the result according to the conditions of his problem. Of course, in the early number work there have been the sense-objects from which number has been perceived, but the mind retreats naturally from objectivity to the pure conception of number, and then to the number symbol. The following is taken from the appendix to Horn's thesis (57), where a 7th grade girl gets the population of the United States in 1820:

7,862,166 whites
233,634 free negroes
1,538,022 slaves

9,633,822

In this problem three different kinds of addends are combined, if we accept the usual distinctions. Some may say that this is a mistake,—that the pupil transformed the "whites," "free negroes" and "slaves" into a common unit, such as "people" or "population" and then added these common units. But this "explanation" is entirely gratuitous, as one will find if he questions the pupil about the process. It will be found that the child simply added the figures as numbers only and then interpreted the result, according to the statement of the problem, without so much mental gymnastics. The writer has questioned hundreds of students in Normal School work on this point, and he believes that the ordinary mind-movement is correctly set forth here, no matter how well one may maintain as an academic proposition that this is not logical. Many classes in the Eastern Kentucky State Normal have been given this problem to solve, and they invariably get the same result:

"In a garden on the Summit are as many cabbage-heads as the total number of ladies and gentlemen in this class. How many cabbage-heads in the garden?"

And the black-board solution looks like this each time:

29 ladies
15 gentlemen
—
44 cabbage-heads

So, also one may say: I have 6 times as many sheep as you have cows. If you have 5 cows, how many sheep have I? Here we would multiply the number of cows, which is 5, by 6 and call the result 30, which must be linked with the idea of sheep because the conditions imposed by the problem demand it. The mind naturally in this work separates the pure number from its situation, as in Algebra, handles it according to the laws governing arithmetical combinations, and labels the result as the statement of the problem demands. This is expressed in the following, which is tacitly accepted in Algebra, and should be accepted equally in Arithmetic:

In all computations and operations in Arithmetic, all numbers are essentially abstract and should be so treated. They are concrete only in the thought process that attends the operation and interprets the result.

Mental, or Oral, Arithmetic.—Much oral drill should be given in all the first six grades. Processes should become almost automatic by the close of these grades. The German schools excel in *Kopfrechnen,* and our American schools can well afford to return to the practice of a generation ago in this matter.

The writer does not think that he has spoken the last word for improvements needed in teaching and in studying Arithmetic, but he does believe that he has pointed to some reliefs from the present discouragements in the results. There is no gainsaying his position that, in the ultimate analysis, the failure to respond quickly and correctly to problems in Arithmetic lies in the mental inability of the child. And beyond this fact we must remember that the child must do his own thinking in the subject. No superintendent, no teacher, no course of study, no text-book can do more than provide him with the proper stimuli and direction for his own development. Growth must come from within. Tests and experimental studies, such as have been brought together in this dissertation, will assist in discovering to us the child's reactions to numbers and to problems involving numbers, and in this way serve to adapt the means of the school to the ends of

individual education. A sensible synthesis of all that has been found good in these studies, and that may yet be disclosed in similar investigations, will hasten the Renaissance in Arithmetic.

VIII. General Summary

1. Arithmetic is one of the chief subjects in the first eight grades of the schools throughout the civilized world. It receives about one-sixth of the total school time.

2. Children show some interest in numbers about the close of their fourth year, and at school entrance at six they have quite well formed ideas of numbers up to 8 or 10. Many are able to count 100 or more.

3. One school of educators holds that the number concept arises from simultaneously perceived groups of objects; another school holds that number is gained from successively perceived stimuli. One would teach by presenting many objects in a group; the other would teach by counting.

4. No definite correlation has been found to exist between the number systems employed by primitive peoples and their civil development. Number systems are known to arise readily when these are needed.

5. Both primitive peoples and children have a natural tendency to symbolisms and this fact makes the growth of the number symbols easy for them.

6. One group of educators advocates deferring number work until one or two grades have been completed by the child in school. Another group favors the usual practice of starting children in numbers as soon as they enter school at six years of age. The child's pre-school interest in numbers would support the latter group, while the successful number work reported by the English Infant Schools and by Montessori is also favorable to this view.

7. The influence of puberty upon arithmetical interests and abilities has been found to be very marked, and it should be clearly understood by teachers who handle children of the postpubertal period.

8. Drill work has been found exceedingly valuable for developing skill in handling numbers rapidly and accurately. Short periods are better than the same total time used in long periods of drill. The permanent effect of drill-work has been found to be much greater than was supposed.

9. Children are inclined to make certain habitual "type-errors." These should be carefully listed by teachers and made the subject of vigorous drill. Much time is squandered in going over matter which the children already know in most

schools, and energy is not concentrated upon the particular difficulties that should be attacked.

10. If problems in Arithmetic are made to deal with situations within the experience of pupils, the subject will be robbed of much of its present tedium.

11. The adoption of a "fixed standard" for achievement in Arithmetic, rather than a progressive one, threatens to work great harm in the schools. The criterion by which to judge the results of teaching should be a growing one, or stagnation will be encouraged.

12. The wording of problems, which are to be distinguished from examples, should receive careful attention in the textbooks.

13. Great individual differences exist among children concerning Arithmetic. These variations range from dread aversion to the subject all the way to special favoritism for it. Early impressions received from parents, tutors, associates, and school experiences all seem to have some influence in determining the *Einstellung* of the pupils toward Arithmetic.

14. Girls have been found to excel boys generally in practical skill in computations, but boys are better than girls in reasoning upon number situations.

15. Children in the first five grades do not have the range of attention or the power of concentration that the children in the upper grades possess. The dawn of adolescence marks the dividing line between the two types.

16. Habits of rapid and accurate handling of numbers must be thoroughly established in the first five grades. Drill to this end should be begun as early as possible after school entrance, and carried forward with special care in the 3rd, 4th, and 5th grades. Habits of combining numbers quickly should be firmly fixed and hierarchies of habits should respond automatically to given processes, while whole federations of hierarchies should gather spontaneously to solve questions involving several processes. Much drill should be afforded with pure numbers, and a minimum of problems involving a study of situations resorted to.

17. Problems may be begun in the 6th grade with profit, and the work will be attractive and inviting if the pupils can perform the operations with ease.

18. Philosophical distinctions between abstract and concrete numbers are not to be urged upon the children in the elementary schools. However true these distinctions are in logic, to teach them in the grades serves no useful or needful end, and adds to the burden of dealing with practical applications of number.

19. Oral, or mental, Arithmetic deserves a wide place in the

early grades, and should not be omitted even from the upper grades. *Kopfrechnen* has a value that pencil and crayon can never supplant.

20. Instead of teaching Arithmetic in the eight grades of the elementary school, Algebra in the first two grades of the high school and Geometry in the last two high school grades, it would be better from several considerations to teach Elementary Mathematics through the entire twelve grades, introducing Algebra and Geometry as early as they can be of real service, and continuing Arithmetic into the high school.

21. Text-books in Arithmetic should have the combined experience and knowledge of the business man, the psychologist, and the pedagogist. If the authorship of texts combines these three interests, a much more practical and teachable book will result.

22. The derivative relation of Common Fractions, Ratio and Proportion to Division; of Decimals to Common Fractions; and of Percentage to Decimals should be clearly set forth in the text-books, beyond which so few teachers are disposed to go in their teaching. This change in the books would do more than any one other thing to clarify the topics, which stand now as apparently separate and unrelated topics to be treated independently.

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A HEALTH EXAMINATION AT SCHOOL ENTRANCE

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In 1876 Dr. Clarence J. Blake of Boston presented a paper before the International Medical Congress at Philadelphia stating clearly and emphatically the needs of medical inspection of school children; but for nearly twenty years this wise recommendation was ignored, the health of school children was neglected, school diseases were uncontrolled, epidemics played havoc with school attendance, many children died from preventable causes, many more suffered from physical defects and unsanitary conditions. It was not until a series of epidemics had occurred in Boston that, finally, that city in 1894 established a regular system of medical inspection for the public schools. Slowly other cities followed until now nearly all of the large cities and many of the states require health inspection to a greater or less degree.

During the last five or six years the need for health inspection has been specially recognized, school nurses have been employed with excellent results in many cities, the need of caring for the teeth has been recognized, and dental clinics established, and the importance of mental hygiene and the hygiene of instruction is now being emphasized. In some places remarkable success has resulted from the methods of health inspection adopted. The excellent results of this movement have been clearly shown in the valuable resumé recently published by Drs. Gulick and Ayres (8), and the widespread interest was demonstrated at the International Congress on School Hygiene held in Buffalo last year.

The work, however, is still far from being adequate even in the cities where the best plans are in operation, and the inefficiency of the medical inspection in many places has given critics an opportunity to make serious charges against the whole plan. Many declare that no good has come from it, and that, in many cases, harm has resulted. Careful students of the subject like Dr. Gulick have noticed the serious defects and pointed out the need of more adequate provision for such inspection.

The feeling that any form of health inspection beyond the mere attempt to detect contagious disease is an infringement of individual and parental rights is widespread. It is well illustrated, I take it, by the recent action of Governor Blease of South Carolina in vetoing a bill for medical inspection of children attending public schools in Richland County. It is reported that the Governor expressed himself as follows: "Before I would sign such a bill I would resign and go off into eternal oblivion," and that he characterized such legislation as "outrageous, uncalled for, ill advised, and dictatorial."

The time has come when, if health inspection is to succeed, it must be carried farther and be made more adequate. The concrete methods by which this may be done can be devised by those actually engaged in the work; and more thoroughgoing and satisfactory methods should be adopted as far as local conditions will permit. One general need should be emphasized at the present time. If health inspection is to be fully successful in any community, the support of the general public and the coöperation of teachers and parents is necessary. One cannot expect the best results when teachers do not know that there are medical inspectors or when parents refuse to permit their children to be inspected. The next step in health inspection may well be an attempt to gain intelligent coöperation from parents and teachers.

The problem of gaining this coöperation is a difficult one and the process is likely to be a slow one. Teachers should have a different training, parents must be educated; but the beginning of such education, the writer believes, may well be made at the present time, and the method he would suggest is that of a thoroughgoing physical and mental examination of each pupil upon entering school life. This examination should be conducted by the health inspector with the aid of the teachers and one or both of the child's parents.

Such an examination of school beginners has been made with more or less thoroughness in Germany, but has not been common in this country. The plan of having the parents present at such an examination is not a new one. Both in Germany and in England the attempt is made to have the parent or guardian attend the examination. The need of the coöperation of parents is recognized in these countries, and the aim is to gain their sympathy and assistance by this method. The memorandum of the British Board of Education states the purpose as follows:

"Nor must the influence which the parent can exercise by example and precept be neglected. One of the objects of the new legislation is to stimulate a sense of duty in matters affecting health in the homes of the people, to enlist the best

services and interests of the parents, and to educate their sense of responsibility for the personal hygiene of their children. The increased work undertaken by the State for the individual will mean that the parents have not to do less for themselves and their children, but more" (8, pp. 75-76).

The need and the advantages of such an examination and the plan and scope of it will be explained in detail presently, but before considering this let us note the biology and the usual chronological and physiological age of the school beginner.

Pre-school Life and the School Beginner

Dr. Thiele (15) has attempted a biological study of school beginners. He began with this question: are the children who begin school at the age of six affected by definite influences connected with the family, heredity, diseases, and the like? His investigation shows the distinct importance of studying such conditions, and that these are significant for judging of the physiological and psychological age of the pupils. If we wish to determine the influence of the school upon the child we must know the condition of the raw material. This he attempted to determine.

His investigation concerned 5,538 children in the People's schools of Chemnitz and was based upon the answers to a questionnaire sent to the parents of the children. This investigation concerned twenty points relating to the family and to the child, and included among others the following questions: Are both parents living? How many children in the family? Was the child educated by one parent, or both, or with the help of other persons? and questions relating to the birth of the child, age of learning to walk and speak, and to conditions of health, contagious diseases, accidents, hearing, vision, etc.

The importance of these family conditions is strikingly shown by the statistics obtained in regard to the number of members in the family. 16.81% of the boys and 23.27% of the girls were only children. 26.05% of the boys and 11,21% of the girls had more than six brothers and sisters. That is, probably in many of these cases the child was the youngest child of the family. The significance of being an only child has been emphatically shown by the investigation made by Dr. Bohannon in Clark University and the study made by Neter in Germany. Dr. Thiele finds that this is an important condition also in relation to disease. In general the only child has been better protected from contagious diseases. For example, only 58.94% of these boys had had measles, as compared with 64.46% of the children in general; and 57.58% of

the girls had had measles as compared with 66.75½ in general. The only children also were more frequently well nourished than others. Conditions of nutrition were satisfactory in case of 99.24% of these boys as compared with 97.66% in general, and 99.39% of the girls were in satisfactory condition of nutrition as compared with 97.96% in general.

A peculiar fact, or at all events, the suggestion of a peculiar fact was brought out by these investigations. The only children in many cases learned to walk more quickly than the others. In fact 72.52% of the boys learned to walk before the first year as compared with 62.34% in general, and 74.24½% of the girls as against 44.80% in general. They learned to talk earlier also apparently; at least 31.18% of the boys learned to speak before the end of the first year as against 22.07% in general; and 37.88% of the girls learned to talk before the end of the first year as against 25.84% in general.

We see from these results that the only child in the family is better protected from contagious diseases than other children, as we might naturally suppose would be the case. Again on the other hand the only child in the family is more likely to be precocious in his development. This again we might naturally infer because such children usually receive more attention from their parents and probably are often over stimulated. Such precocity in learning to walk and to speak, and the like, is looked upon with grave suspicion from the point of view of hygiene.

The large percentage of the children who already had had the common contagious diseases shows the advantage of not having children enter school before the age of six, and would indicate that by this time the majority of children in Chemnitz are protected against measles but not protected against other school diseases. Thiele's results are probably typical for many urban communities.

Age and Development on Entering School

The problem when the child should enter school is one which should be considered from many points of view. The primary considerations are two. First, the physiological age of the child; the significance of this has been shown very emphatically by Dr. Beik (5). One can see from his paper what the normal physiological age for school entrance should be. The other important consideration is the relation of the home to the school. Frequently the condition of the home is such that a child may be better off to attend school even if not properly developed for school life.

Even from purely pedagogical considerations there seems to be no evidence that it is an advantage for pupils to enter school at an early age. Mr. Winch (16) has made an extended study of this problem in a number of English schools, and his results indicate that there is little if any gain in having children in that country enter school before the age of five or six.

Among the conclusions that Mr. Winch deems fully established by his facts are the following:

1. "That from the entrance age of three to five, early entrance confers no intellectual advantage on the child, either in his infant school work or in his subsequent progress in later school life."
2. "That there is some reason to suppose that children who enter after five years of age show some retardation in subsequent school progress. . . . But I am fully conscious that these children who enter after five are "selected" children. Some are weak in health, some come from very good homes and have had a good deal of instruction at home, and some have been *driven* into school by the compulsory attendance officials."
3. "That these conclusions are quite independent of the particular form of teaching adopted."
6. "That no advantage appears to exist in early entry so far as the subsequent attainment or good behavior and the development of attentiveness are concerned."

If, as at present is the case, we admit children at a given chronological age, then, as seems to be shown by these studies of Winch, from a pedagogical point of view there is no appreciable advantage in having children enter before the age of five or six. On the other hand the investigations by Ayres indicate that it is desirable that children should enter at the age of six or at least at the age of seven.

In one study made by Ayres (3) in 1909, the complete school records of all children in the graduating classes throughout the entire city in June of that year were available, 16,000 in all, and the investigation covered their complete school records. Only the records of children who had entered the first grade and completed the eighth grade were tabulated, a total of 11,185 cases. The ages at beginning varied from five to twelve years, and the time for completing the course ranged from 5½ to 13½ years. The investigation clearly showed that children entering school at advanced ages made more rapid progress than those beginning earlier, but that the difference was slight.

Dr. Ayres made a study also of the records of 13,867 children in 29 other cities, and he divided these records into three progress groups in which those who had taken more than eight years to complete the eight grades were termed slow; those who had taken just eight years, normal; those

less than eight years, rapid. The results of this tabulation are shown in the following table.

PROGRESS CLASSIFICATION OF 13,867 CHILDREN IN THE EIGHTH GRADES OF 29 CITIES, ACCORDING TO PER CENT RAPID, NORMAL, AND SLOW IN EACH ENTERING AGE GROUP

Age At Entering	Per Cent Rapid	Per Cent Normal	Per Cent Slow
5	10	58	32
6	27	52	21
7	40	45	15
8	59	33	8
9	81	17	2
10	98	2	—
11	100	—	—
12	100	—	—
13	100	—	—
14	100	—	—

These results raise the following problem as Dr. Ayres points out. "Is the best entering age the one which results in the greatest proportion of rapid pupils, the smallest proportion of slow pupils, the largest proportion of normal pupils, or the most equal balance between the three groups?" His opinion is that "the best entering age is the one that results in a large proportion of normal pupils combined with most equal balance between the rapid and slow groups."

The general result of his investigation he summarizes as follows:

1. "The results of these three studies of the school histories of more than 25,000 school children who have completed the elementary course indicate that children entering at advanced ages subsequently make more rapid progress than those who enter younger."
2. "The subsequent progress of children entering at the more advanced ages is slightly more rapid than that of those entering at the lower ages, but it is not sufficient to enable the child to overtake in the school course the child who entered younger."
3. "The entering age of six is the one which makes the best showing with respect to resulting in a large proportion of the children making normal progress and a nearly even balance between the rapid and slow groups."
4. "The entering age of six is the one which makes the best showing with respect to resulting in the largest proportion of the children finishing the course at normal age and a nearly even balance between the under-age and the over-age groups."
5. "The entering age of six furnishes the most homogeneous group, judged on the basis of subsequent progress."

Of course in interpreting such results it should be remembered that as our schools are organized in most places it is not easy for a child who enters at a late age to be promoted more rapidly than the class, even if distinctly better progress is made. And frequently a child who has never been in the

school is placed in the first grade, when it could well do the work of the second or perhaps even the third grade. And, finally, it is not a question of mere progress, but a question of psychological development and of hygiene.

The custom of this country and in several countries in Europe is to have the child begin school at the end of the sixth year of life. Dr. Steinhaus (12) as a result of his investigation maintains that the completed sixth year represents the most favorable age for entering school, the one best adapted to the physical and mental development of the child. While probably most children at this age have the physiological and mental development necessary for doing work of the school without injury to health, many others have not yet attained suitable development. Consequently it is desirable to consider physiological and psychological age rather than chronological age. Let us note the more obvious signs of the stage of development the normal child is likely to have attained at the age of six.

According to the investigations of Camerer, Monti, Lange, Gundobin, and others, the majority of boys at the completion of the sixth year have attained a height of 110 cm., and the rate of growth in the sixth year is 5 cm. A boy of 7 years of age usually has attained the height of 115 cm., and the rate of growth for that year is 5 cm. In the case of girls the numbers are on an average 1 cm. smaller. Also the measurements of children on entering school in different cities have given similar results. Among the children measured by Quirsfeld, for example, the smallest height for the children completing the sixth year was 98 cm., and the greatest, 127 cm. One-third of the pupils had a height between 109–113 cm.; a few, 2.5%, had a height of over 120 cm.; and a considerable percentage, namely, 3.5%, had a body height of less than 110 cm.

In the second place, as regards body weight. The weight of children entering school, according to investigations of Quirsfeld, varied between 12 and 27 kg. 75.4% of the children showed a mean body weight of 19.5 kg. Stephani among the Mannheim children on entering school found the following averages. In the year 1906, for boys 19.46 kg., for girls 18.82 kg.; in the year 1907, boys 19.79 kg., girls 18.88 kg.; 1911, boys 20.10 kg., girls 19.30 kg. The minimal weight with the boys in 1907 was 14.35, among the girls 12.56 kg. The average on entering school after the completed sixth year, according to the figures found by different investigators, is for boys about 19 kg., for girls about 18 kg.

Some maintain that the circumference of the head is also a significant measurement. Gundobin found at the age of five

with boys the average circumference 50.1 cm., with girls the same. At the age of six for boys, the average is 50.8, for girls 49.4. Monti found an average circumference of 51 cm.

The figures represent fairly well probably the gross physiological development of German children in the Peoples Schools. On the basis of these Dr. Steinhaus makes the following demands: The height of children on entering school should be at least 110 cm., the weight 18.20 kg., the chest circumference 52–54 cm., the head circumference 49.5 to 50.5 cm. at the end of the completed sixth year. A child that has this development can be admitted to the institution without hesitation, according to him. And in his opinion there are no serious objections to admitting a child whose height is only 108 cm.

The social environment of children is an important factor in determining their development, and so in Germany, where different classes of children attend different schools, most of the children attending the People's Schools, some the middle schools, and others the higher schools, it appears that a different standard is necessary for the different schools. Dr. Selter points out that children entering the Gymnasium are from 4 to 6 cm. taller than children entering the People's Schools. Hence he suggests, as minimal standards of height 110 cm. for those entering the Peoples Schools, 113 cm. for those entering the middle schools, and a still higher figure for those entering the secondary schools.

There seems to be a pretty general consensus from the medical point of view that children should not attend school before the completed sixth year, and that children who are imperfectly developed, the weak or diseased, should be excused from entering school at that time.

From the point of view of hygiene only those children are fitted to enter school who have that degree of strength and development that makes them capable of standing the confinement of the school and performing its duties without injury to health. The bearing of our present knowledge of development on the usual and suitable physiological age at school entrance has been shown in the excellent paper by Dr. Beik. It should be that of the normal child at the age of perhaps six and one-half years.

Even among children of the same social status there are wide individual variations. Thus it is necessary that studies of different types of children should be made and standards determined for the physiological age of these different types. Until a thoroughgoing study of the biology of the school beginner in this country has been made and such standards

determined, we must use merely rough, and ready methods corrected by general observation. Perhaps the following will serve as minima for children in this country.

1. The height should be at least 115 cm.
2. The weight should be at least 20 kg.
3. The circumference of the chest should be at least 53 cm.
4. The child on entering school should have all four of the sixth year molars.

The standards should be much the same at this age both for boys and for girls, although for girls a little less than these standards as regards height and weight may be permitted. Again in the case of children who clearly belong to a smaller type physically exceptions should be made to these norms. In both sexes and for all types the presence of all four of the sixth year molars should be required.

Scope of the Examination

The suggestions of the German physicians in regard to school entrance are excellent, but in my opinion we should go much farther than this. The following things seem desirable.

There should be a physical examination participated in by the teachers and parents as well as by the school physician, and this examination should include the following things: 1, a test of physiological age; 2, a test of psychological age; 3, a test of the general health condition; 4, a history of the morbidity of the individual child.

The test of physiological age may at first be confined to the things already mentioned; but probably in the near future, after further studies of the biology of the school beginner have been made, it will be possible to note other important conditions and determine more accurately the stage of physiological development. X-Ray photographs showing the development of the epiphyses of the bones, tests of the range of the voice, of the development of the eye, and other organs, may probably be included.

2. The tests of psychological age will at first be along the line of the Binet and Simon tests supplemented by other tests, especially perhaps of motor ability and the ability to form practical judgments in new situations, and these controlled by the results of observation by parents, teachers, and physicians.

In the tests of psychological age also, attention may well be given to the habits of observation, of attention, association, and the like, calling the attention of both parents and teachers to habits as of fundamental importance. This psychological examination should include the determination as far as possible of the mental type to which the individual

belongs. Probably less can be accomplished in the way of determination of the child's type of imagery than many psychologists have supposed; but still more important than this is probably the determination of the learning type. Although no adequate experimental studies have been made, so far as I am aware, observation seems to show pretty clearly that there are two marked types of learners, one type which learns easily by instruction, by hearing and seeing what others do, and from definite directions and demonstration; that is, a type which learns easily by the usual didactic methods of the school. On the other hand, another type which learnes chiefly by doing, and this by one's own method. The ordinary methods of the school, however, are usually adapted to the child that learns by hearing, by instruction; and the individual of the doing type is at a great advantage and often appears dull. It is of the utmost importance that these two types be distinguished as early in school life as possible, and the beginning of diagnosis should be at the entrance of school life.

Which of these two types is the better we need not discuss, but the work of the school clearly gives an advantage to the child that learns by hearing and seeing, that learns by instruction; and such children are likely to succeed in school work as the school counts success. On the other hand, children who belong to the doing type are likely to learn more thoroughly what they do learn, they perhaps more often acquire the habit of independent thinking, they are not handicapped by conventional methods and conventional ideas, and are more likely probably to do original work and to add to the sum of human knowledge by invention or scientific or artistic production. It would be better probably if the work of the school were more adapted to this latter type; for even the other type would probably be benefited by having more training by actual doing. That, however, is another story not to be told here.

The test for psychological age can be carried much farther and be made much more adequate when more careful investigations have been made bearing upon this subject; for example, after the promising investigations by Krasnagorski and others by Pawlow's methods have been perfected, it will be desirable probably to make tests of the conditioned reflexes, memory reflexes, and the like. Tests of association, of the various learning types, of voluntary action, inhibition, and of mental attitudes, may all be ultimately included.

3. The test of the health condition should be primarily to determine the general physiological condition, and also more concretely the condition of the teeth, the throat and the nasopharynx, specially noting the condition of the tonsils, the

presence or absence of adenoids, the occlusion of the teeth, the condition of the eyes, ears, and so on.

4. The morbidity history as far as possible of all diseases that the child has had should be recorded, and especially should be noted whether the child has had rickets, scrofula or any form of tuberculosis, convulsions, measles, scarlet fever, whooping cough, diphtheria, chicken pox, mumps, etc., etc.; and such a record for each child should be kept in the school or by the medical inspector or board of health.

This morbidity test should include also a very careful noting of bad habits, not only habits obviously detrimental to health, biting the finger nails, sucking the lips, placing the tongue in abnormal position and other habits that tend to produce dental defects, but also any bad habits as regards cleanliness, chewing the food, digestion, excretion, and bad habits of attention, association, and the like.

Significance of the Examination

The entrance on school life presents an opportunity for hygiene that has been strangely neglected. An examination of school beginners as regards physiological development and general physical condition has vast possibilities. It gives opportunity not only to determine whether a child is in condition to do the school work without injury to health, but also to educate the parents; and further it gives opportunity to have the child put as far as possible into good physical condition. We have already recognized the right of the State in matters pertaining to health. We insist, for example, that a child shall be vaccinated before entering school. We insist that a child shall not come to school with a contagious disease. There is a feeling, however, on the part of many, that to go beyond this is an interference with individual rights and the prerogatives of the home. This is a survival of the old idea that the function of hygiene is negative. With the new view of the positive function of hygiene, there seems to be equally good reason for requiring such a condition of health and development as will enable the pupil to do the work of the school efficiently and without injury to health.

A thoroughgoing examination should be made at the beginning of school life. Plenty of time should be given for this, and it should be in the nature of a consultation of experts. The school physician should be, not only a medical expert, but also an expert in school hygiene. The teacher, if with some professional training, is to some extent an expert in school work. The parents having watched and trained their own children are in a certain sense experts in regard to them.

Here in this problem of school entrance is to be found, if not the key, at least the strategic point of attack, for many of the pressing practical problems of school education to-day. Such a thoroughgoing examination conducted by the school physician, parents, and teacher, would be of great value pedagogically as well as hygienically.

For example, it is pointed out by the wise that a better coöperation between the home and the school is necessary. Here is the place to begin coöperation. In a tactful examination such as that mentioned, if made by fairly intelligent school physicians and teachers, coöperation of parents could be gained in a natural way. By consulting the parents in this examination in regard to the peculiarities of their child, the diseases the child has had, and his general condition of health, the expert character of the parent would be recognized and an attitude of coöperation would be easily aroused.

This problem is of fundamental importance because it is only by coöperation of the home and the school that we can satisfactorily solve the problems of adapting school work to the capacities of the children, of proper care for their health, and of vocational guidance.

The evil of the present lack of coöperation between the home and the school has been often pointed out, and it is illustrated by the attitude of teachers as well as that of parents. When a subject like overpressure, for example, is discussed, we teachers are apt to say that the conditions in the home are responsible; that it is the work children do before coming to school, and the dissipation of the home, not the work of the school, that causes overpressure. The home, not the school, is to blame,—as if that settled anything. When there is illness or inefficiency among school children; again it is the home we blame; conditions are more hygienic in the school than at home. Such shifting of responsibility is easy; and all this is largely true. But reflect for a moment on a very obvious truth. Most of these parents a few years ago were pupils in the schools. In twenty-five years children entering school now will be the parents.

Again we say the parents need to be educated. This is the burden of much of the pedagogical literature of today. We cannot solve the problems of the school until the parents are better educated is the common lamentation; true enough, but how shall we begin to educate them? A better way could hardly be devised than an entrance examination for the children in which the parents could participate. Such an examination would educate the parents not merely because physician and teacher would have opportunity to give advice; but far more because parents would learn by means of it that school

work is not an occupation to be taken up lightly and dropped again when something lucrative is offered for the children, but a serious matter requiring health, and a degree of physical and mental development. Entrance on school life is too easy. Parents would prize the opportunities and privileges of the school more if it were harder to obtain them. Thus the time and inconvenience required for the examination would be a distinct advantage because an important means of educating the parents.

One great cause of the inefficiency in school work and the lack of adaptation of school occupations to individual capacity and health, is the fact that we do not begin right. An examination like that described would be a good beginning; it would go far toward developing the right attitude in parents toward the school; it would acquaint the teacher with important facts in regard to the character and home conditions of the pupils; it would give the physician important facts in regard to earlier development and the morbidity history of the pupils; and after more biological studies of the school beginner have been made, it would enable the physician and teacher to determine both the physiological type and the learning type to which the individual child belongs. And, finally, it would change the attitude of the teacher toward the parents; in many cases give them a wholesome respect for the expert character of the parents as regards their own children, and make it far easier for both parents and teachers to coöperate.

Another great problem is that of retardation. Among the causes of retardation recognized by Professor Strayer (13), in his article on this subject in Monroe's Cyclopedia of Education, are: "Illness extending over a long period, backwardness or mental deficiency, the lack of a school course adjusted to the needs of varying abilities." The difficulties mentioned by Dr. Strayer,—illness, mental deficiency, an ill-adjusted school course—should be attacked at the outset in the light of a thorough study of the raw material when brought to the school. Again the money cost due to the repeaters has often been pointed out. The estimates of this have perhaps been exaggerated, but the cost in any case is enormous and the waste of time and energy great. A large part of this could be saved by admission tests and by proper grading, and the saving of money would probably more than make up for the added expense of this examination.

One of the reasons for retardation is the fact that children enter school prematurely or in such imperfect physical or mental condition that they cannot do the work of the school. Failure occurs from the first, and the pupil handicapped both physically and mentally is turned back at the close of the year

to repeat the same dreary routine. The place to begin the prevention of retardation is at the entrance of school life.

The next great educational problem concerns the elimination of pupils. Why do pupils drop out of school before their course is completed? It is usually because they do not succeed in school work, or because they are more interested in something else, or because the parents do not coöperate with the teacher in trying to keep them in the school. An admission examination of the thoroughgoing kind mentioned would not only prevent those who cannot succeed in school work from entering, and make better adjustment possible, thus averting many heartbreaking failures among the pupils, and much futile worry and effort among the teachers; but, as already suggested, if it were harder to enter the school, parents would not esteem its privileges so lightly nor be so ready to let their children leave it.

Again take the group of problems included under the word efficiency. During the last few years this has become a word to conjure with. The term is more or less abhorent to the scientist, because, on the one hand, it often stands for a superficial view of the great problems of life and work; on the other, because many of the principles of this new science of business and industry were worked out twenty-five years ago by Mosso and others in the laboratory, and then ignored because business was ignorant of science. But the problems involved are of vital importance; and it is well that they have been put in the terms of the shop and the counting room and thus made to appeal to those who have a business apperception.

What, however, could be more inefficient than our present haphazard method of beginning school work without determining whether pupils are fit for school occupations or not? Why should the public money be spent in trying to teach those who can profit little by instruction or who are likely to be injured by it. The teachers are also handicapped by the presence of such children, and it largely thwarts the purpose of school education. From the point of view of common sense, and efficiency, let alone hygiene, is there any good reason, any justification for admitting children to school work in the present haphazard fashion and in neglecting to give such an examination at the beginning of school life? Admission of the deficient should be postponed or they should be placed in special classes.

Another great problem of the school is the problem of grading. It is obvious if children were tested at the beginning of school life, if the different working types were distinguished, and if the feebleminded were excluded, it would be far easier later on to solve the problem of grading. Many of

the difficulties of this great problem would be removed by such an examination, and the right beginning would save a considerable number of repeaters in the early grades.

Most important of all perhaps is the problem of obtaining the right attitude between pupil and teacher. A thorough examination of the children at the outset would help much toward ensuring this. The teacher would learn the handicaps of defective vision, defective teeth, chronic disease, unfavorable home conditions, and the like. Such an examination would be of great advantage to teachers also in another way. The great mistake still found almost everywhere is that of giving attention to the subject to be taught rather than the child to be educated, the subject of culture rather than the object of culture. An examination of this sort would at the outset call the attention of teachers to the needs of individual pupils, and the advantage to teachers might be as great perhaps as to the parents.

Educators now are beginning to recognize that the knowledge acquired in the school amounts to relatively little, but the habits formed and the attitudes toward life and society and work that are carried away from the school are of vital importance. A circular issued to the State inspectors of schools by the State Superintendent in Wisconsin calls attention to this fact, and this is coming to be the keynote of the exhortations to teachers. If, then, this be the aim, what could be more important than to start school work aright and to have the right attitude toward the school developed at the outset in the minds of parents and teachers on the one hand, and the right attitude in the mind of the teacher toward the pupil on the other hand.

Such an examination will seem of course Utopian; but practical school hygiene no longer fears this charge. The difficulties connected with such a plan are likewise great. One objection that will be urged is the fact that so much time and expense would be required to make such examinations. Of course it is all a question of relative values; but if, as is probable, the whole scholastic career of the child is likely to be influenced by the way it begins school work, and if the attitude of parents and teachers is to be determined largely by such an examination, and if the school work for the early years at least will be made far more efficient by having it, and if, finally, the parents are likely to be educated by such an examination to better coöperation and greater interest in the school, how could the time be better spent? It would be an excellent thing in most cases if both parents were required to give up half a day for such an examination with provision of course that in case of special need

one parent might be excused. Nothing probably would do so much to make the parents interested in the work of the school, to make them prize its opportunities, to make them coöperate with the teachers and to make them give more intelligent attention to the physical welfare and health conditions of their own children.

That the attitude of parents toward the school, toward an examination of this kind, and toward special instruction for peculiar or defective children can be changed, has been shown by the experience of the Child Study Bureau and social workers in Chicago. Jane Addams (1) has given interesting illustrations, and her paper given a few years ago before the Department of Special Education of the N. E. A. is so excellent that I quote from it at length:

"When deficient children are discovered in their homes, are taken care of by trained teachers, after they have been diagnosed by child-study departments, and when all the apparatus of public education is turned on, the parent is convinced that his child is not an exception. When the parent is besought to aid in this process of special education, then he first loses his peculiar sensitiveness in regard to his child. The reaction of this change of attitude upon the entire family is something astounding. I think it was Father Huntington who once said that the essence of immorality is to make an exception of one's self, and certainly the essence of self-pity is the conviction that one is so isolated. Comradeship dispels self-pity as the sun dries up dampness. You think you have a child unlike other children; you are anxious that your neighbor shall not find it out; it makes you secretive; it makes you singularly sensitive; it places you and the normal children in the family in a curious relation to the rest of the community; but if you find out that there are many other such children in your city and in other cities throughout the United States, and that a whole concourse of people are studying to help these children, considering them not at all queer and outrageous, but simply a type of child which occurs from time to time and which can be enormously helped, you come out of that peculiarly sensitive attitude and the whole family is lifted with you into a surprising degree of hopefulness and normality. I could illustrate this with many tales. This reaction of the schools for special children upon the home may bring back into the school some of that early devotion to them which we are in danger of losing.

"During the period of detention every child is subject to the medical treatment which he specially needs; he is put into a school. . . . The results are simply amazing. Sometimes one actually fails to recognize a boy after he has been in this school a short time, such is the result of good food, of baths and all the rest of the things which Mr. Brockway years ago proved efficacious. After he had been subjected to this treatment for a month or six weeks his own parents subtly change in their attitude to him. The mother recognizes that which she always knew was there, although she had no power to bring it out; and the father, who was said not to be fond of him, suddenly swells with a new sense of pride. The onlooker wonders why this hasn't been done before the child was arrested, before he had to be brought to this preliminary disgrace."

"I have seen an Italian family change their entire attitude toward a crippled child who was taught to carve wood with his one hand so well that he earned a very fair wage in a furniture factory. . . . To bring the home and the school into closer connection through these special children affords a glorious educational opportunity, and the results may react upon the schools in a way we can, as yet, scarcely estimate."

It frequently becomes necessary on account of the ignorance and poverty in many homes for the school to assume functions that do not belong to it. It may well be maintained, for example, that it is not the function of the school to bathe children nor to clean their teeth; but it often becomes necessary for the school to assume such duties. In all such cases, however, the principle should be for the school to assume them in such a way that it will not be permanently necessary. The parents should be so educated that after a time they will assume the functions that really belong to the home, and in any case the training should be such that when the pupils that are in the schools today become the parents of the next generation they will be competent and willing to perform the duties that really belong to the home. Education of the parents of today would be greatly furthered by their presence in this admission examination.

Again it would tend to give teachers the right attitude toward the home and toward children. Teachers should always recognize the authority, the responsibility, and the general expert character of the parents in the education of their own children. The numerous exceptions to this can be treated all the better by one who recognizes this general truth. On the whole, perhaps we may say that parents are not much more inefficient than we teachers, and certainly we can learn much from a child's parents in regard to the best methods for his education.

Again such a plan is likely to make not only the work of the teacher easier, but to make it far easier for the medical inspector to do his work without interference from the parents and to make the school nurse a welcome visitor in the homes. Such a plan with a suitable system of medical inspection and with school nurses would also make it far easier to control contagious diseases. The interests of general hygiene as well as of school hygiene would be greatly furthered. The medical inspector in turn will lose nothing by recognizing the general expert character of parents in regard to their own children.

Many things of vital importance in connection with the development of children are likely to be known only by the parents and would be gladly contributed by them in such an examination. For example, children who are born prema-

turely are apt to have a precocious development, as might be supposed. The premature stimulation from the external world hastens the medulation of the nerves, and I understand that observation shows that in later years such children are more liable to certain disorders and are less able to do the work of the school. Such a fact is of vital significance for adapting the work of the school to the individual, and parents alone are able to give this information.

The work of medical inspection cannot be carried out satisfactorily without the intelligent coöperation of parents. The difficulties found by the inspectors in performing their duties in health inspection illustrate this concretely. Dr. Arnold (2) of Boston has reported cases in the early years of medical inspection in that city, among them the following:

"Four cases were sent home with suspicious-looking throats. With each child was sent a note stating that there had been some cases of diphtheria in the schoolroom, that the child had a sore throat that probably was diphtheria, and that the school inspector advised calling the family physician. The doctor was not called in a single case. The mother of one of the children brought him back herself in the afternoon, and was abusive to the teacher for sending him home. I turned up just in season to get my share. I was informed that I did not know what I was talking about; that his nausea and vomiting and constitutional symptoms two days before were due to indiscretion in eating; that his sore throat was "simply tonsilitis," that he was subject to, and that the patches in the throat were of no importance. The other children might have diphtheria, but her boy didn't "because he wasn't sick enough." She refused to let me take a culture, and was informed that the boy would not be admitted to the school until a negative culture had been obtained by myself, or, if she preferred, by her family physician. She did not go to the family physician until another week had elapsed, when a culture proved negative. I feel reasonably sure, however, that an earlier culture would have been positive.

"The three other cases returned next morning. Two brought verbal messages that they were well enough to come to school. The third brought a note from his father, saying that it was absurd to say his boy had diphtheria. Cultures were taken from all three throats, and all proved positive. The mother of one of these was not convinced even then. She called another doctor to prove that the school doctor was wrong, and discharged him when he obtained a positive culture, and she was only partially persuaded there was no trick to it when a third doctor also found a positive reply to his culture."

A Health Year For Beginners

Health inspection comprises two things: first, limited medical inspection for detecting and controlling contagious diseases; and second, physical and mental examinations to determine the stage of a pupil's development, physical defects, non-contagious diseases, and the like. There is a growing consensus of opinion that while the former may be placed

under the control of the Board of Health, the latter should be under the control of the educational authorities, or at least conducted with their full coöperation. In any case there should be concentration of authority and responsibility in the hands of competent experts, and adequate records should be kept.

The latter form of health inspection should be made much more thoroughgoing than is now customary. The results of recent investigations in child hygiene indicate that the aim and character of elementary education should be revolutionized and the emphasis placed especially on health, normal development, spontaneous motor activities, plays, voice drill, and the like; that if the work of the school is to be done successfully in later years special care should be taken at this period to put the child's physical organism in the best condition possible for healthful development. This is the time to care for the development of the vital organs of the body, to protect the sense organs, and to develop habits of healthful activity in the widest sense.

If the hygienist could have his way the first year of school life, or perhaps the first two years, would be a *Vorschule,* in which the teachers would be physicians and hygienists; and the aim for this year would be to determine the child's stage of development, his physical resources, his physical defects, and so on, and as far as possible to remedy these defects and to foster normal development by ample opportunity for play and other forms of spontaneous motor activity.

Note what happens at that great epoch in life when a child enters school. There is a great change in environment. The freedom of the home and of the street must be given up for the restraint of the schoolroom. Customary stimuli are replaced by new ones. Customary reactions must be inhibited and new forms of response acquired. In general, an attempt is made to develop the power of inhibition and of voluntary attention. As a result the first year is apt to be a trying one. In Germany this has been indicated by several studies. The need of a special examination at school entrance and of special hygienic care during the first year of school life in that country has been strongly emphasized by the results of several investigations which show the work of the first school year correlated with a decrease in the rate of growth and an increase in the amount of disease. Dr. Schmidt-Monnard (11, p. 362), for example, as a result of investigations carried on for years in Halle, found that with the beginning of school life there was a decrease in the rate of physical growth. According to his studies carried out on the same children the yearly increase in weight for those who had not yet entered

school was, for the years 6 to 7, 2.2 kg. for the boys, 1.9 kg. for the girls. The rate of increase in height was 7.4 cm. for the boys, 5.4 cm. for the girls. On the other hand in the case of children of the same age who had already entered school the yearly increase in weight for the year 6 to 7 was for the boys only 1.5 kg.; for the girls 0.6 kg., and the increase in height for the boys 4.2 cm., for the girls 4.5 cm. Thus the increase both in height and weight was less in the case of both boys and girls who were in the school than in case of the boys and girls of the same age who were not in school.

Hertel, in Copenhagen, where the children entered school at the age of seven, found a considerable increase in the morbidity of the children in the 7th school year; that is, in the period after school entrance, and a decidedly marked minimum of disease in the sixth to the seventh year, that is, the year before school entrance. In Halle, on the other hand, where the children entered school a year earlier, this year, 6 to 7, was the time of an increase of the morbidity.

Dr. Quirsfeld (11, p. 363) also studied the effect of the first school year on 1,014 school children. According to him the average increase in growth in the first school year was 2.5 cm., in each succeeding school year 5 cm. The average increase in weight in the first school year was only ½-1kg., in the second school year 1–2 kg. He found also in the course of the first school year a decrease in weight in case of 15.87% of the boys and 24.84% of the girls; a standstill in weight in the case of 29.73% of the boys and 44% for the girls; he found also in the course of the first school year a decrease in muscular development in the case of 29.59% of the boys and 49.05% in the case of the girls.

As Dr. Quirsfeld remarks, it is difficult to give the cause of this; whether the seventh year of life is the period of weakest physical development it is difficult to say. As a control it would be necessary to have a sufficiently large number of children of the same age, who during the seventh year of life were out of school, living a free life as heretofore. Injurious influences, mental overstrain, fatigue, insufficient sleep—in modern schools and with modern methods of instruction—can hardly, except in individual cases, be alleged as possible causes for arrest in physical development. The causes may be exclusively individual constitution and changed conditions of life.

Until we have such a preparatory year devoted to health and development, the problem of what should be done with those children who would be excluded from school by such an entrance examination is an important one. In Bonn and other cities in Germany where an entrance examination of more or

less thoroughness is made, the children excluded because of lack of physical development are usually placed in a kindergarten. Such a plan modified to suit local conditions, especially if the kindergarten has largely out-door occupations, seems an excellent one.

Summary

The reasons for a thoroughgoing health examination like that described above are obvious. Such an examination is desirable:

1. To prevent those children who are in ill health or not sufficiently developed physically and mentally from entering.
2. To provide the necessary physical data to enable teachers so to order the school work that it will not result in injury to health or a check to development, as often happens in the first year of school life.
3. That proper grading and adaptation of school occupations to individual capacity may begin at the outset of school life.
4. To give school physicians the data necessary for safeguarding the health of children against contagious diseases and the like.
5. To give teachers proper knowledge of the new pupils and the right attitude toward them.
6. That children may begin right and be saved from unnecessary failure and retardation or elimination in later grades.
7. To educate parents and foster a right attitude toward the school.
8. Finally, it is desirable in order to save the money of tax payers, now largely wasted, and so badly needed to provide for absolutely essential hygienic conditions.

Children who should be excluded from school are the following:

1. Those who have any infectious disease should of course be excluded from the school.
2. Children that have rickets, or the after effects of rickets to the extent that they are in poor physical condition and liable to develop neuroses or some other defect from the influence of school work.
3. All children who have tuberculosis, unless there are out-door schools in which they can be placed.
4. Children that are in a serious condition of anemia, unless again there are out-door schools where they can be placed.
5. Those who have any chronic disease that is liable to be aggravated by school attendance or would interfere with school work.

6. Those who are in a retarded stage of physiological or mental development where this would be improved probably by keeping them out of school, and where injury would be done by admission to school, or where it would interfere with school work.

7. Those who have serious sense defects.

8. Those who have any neuroses or the like that would be psychically contagious, epilepsy, chorea, stuttering, and the like.

9. Children who have not been vaccinated.

The importance of this entrance examination can hardly be exaggerated; and here is an opportunity where women's clubs, parent-teachers associations, and similar organizations may use their efforts to good effect, to bring about as soon as possible a public sentiment which will not only permit, but demand, a thoroughgoing examination of this kind. It is the next step that should be taken in health inspection. Of course any such proposition will meet objection, especially perhaps on the score of the expense involved. But as already suggested it would probably make for the highest economy in the end. And if one school or one community should give the plan a fair trial, the chances are that the movement would spread rapidly. In order to make the results satisfactory, however, the examination should be thoroughgoing, plenty of time should be taken for it, and both parents and teachers should be present.

Of course the practical man will say that a plan of this kind is admirable, but at present it is quite out of the question because it would never be possible to get parents to attend such an examination and give the necessary coöperation. Of course it might not be possible in all places, but it would be possible in certain communities at least to approximate a plan of this kind, and this is the ideal toward which health inspection should work. The present dissatisfaction with the schools, the present interest in so-called methods of efficiency in business and industry as well as the universal interest in the health and welfare of children, and the excellent results that would appear after a few years' experience with the plan, would ensure its being copied by other communities. The important thing is that it should be given a fair trial in some representative locality.

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CONTEMPORARY UNIVERSITY PROBLEMS

By G. Stanley Hall

(Address at the exercises celebrating the twenty-fifth anniversary of the opening of Clark University, March 28, 1914.)

The story of Clark University during the quarter century of its existence, the close of which we celebrate today with the alumni, under the inspiring guidance of Dr. French and his committee, has in some respects no parallel in academic history. Especially the first few years of our annals have both brighter and darker pages than I can find in the records of any university. Thirteen of us instructors had taught or taken degrees at the Johns Hopkins, and we left that institution, which had added a new and higher story to the American university when it was at the very apex of its prosperity and hence were naturally inspired with the ideal of taking the inevitable next step upward, as indeed were all the other members of our original faculty, which was remarkable, if not unprecedented here, in its quality. Of the no less notable original Board of Trustees, every member of which has now passed away (while death has not once invaded the ranks of our professorial corps), the triumvirate, Hoar, Devens and Washburn, who stood nearest to Mr. Clark, as his executive committee of all work, estimated the resources that were ultimately to be at our disposal at from eight to twelve million dollars, and very likely more.

I was at the outset sent on an eight months' trip to Europe, with several score letters of introduction, including one from the national government which gave me access to the inside workings of *Kultus Ministeria* and university circles and archives, so that my trip constituted a pedagogic journey I think almost without precedent. Twenty-five years ago these very weeks I was on this unique mission and was surprised to find the most eminent men of learning in Europe profoundly interested in it, and so lavish with their time, sympathy and counsel. I was entertained by Lord Kelvin, Pasteur, Helmholtz, Jowett, and some scores of others of the greatest living leaders in scientific thought, went on a trip of inspection of German universities as the guest of the Prussian Minister of Education, von Gosslar, and, perhaps most embarrassing of all, was taken in state by General Trepanoff on a visit to the

two great Russian military schools near St. Petersburg, in each of which an all day's program of military evolutions had been arranged for my special edification, was a guest of honor at a meeting of Swedish universities, etc. My instructions from Mr. Clark had been to see everything and every institution possible, collect building plans, budgets, administration methods of every kind, and find out a few of the best men who might be willing to come to a new institution here, but to engage no one but to be ready to negotiate with them later. The amazement to me was how lavish everybody was of advice, how cherished and often how elaborate were the ideals of university men, many if not most of whom seemed to have imagined installations of their own departments rivaling not only Bacon's House of Solomon, but sometimes almost suggesting apocryphal vision. From my voluminous notes of that trip could be compiled ideals lofty, numerous and far-reaching enough to inspire all the universities of the world for a century, and to organize a new one here for the conduct of which ten times ten million dollars would be sadly inadequate.

They gave me plans of the then new four million dollar university building at Vienna, of the new Sorbonne at Paris, its rival, of the complete new university which Bismarck had established at Strasburg to show Elsass-Lorraine, which Germany had just annexed, and to show especially France, what the Teutons really meant by higher education, of the newly built university at Kiel, in which Germany sought to impress upon the Scandinavians the same object-lesson, in her newly acquired Schleswig-Holstein, and which was designed to compete with the neighboring university of Copenhagen, just as she rehabilitated Koenigsburg to impress the same lesson upon the nearby Russian rival institution at Dorpat. I was given in some cases the secret *état* and the unprinted *Statuten* of the universities,—all this until I felt an almost Tarpeian embarrassment, especially as I was in nearly all these places utterly unknown and an object of interest solely because of my unique mission. I found young professors prone to see visions, and old ones to dream dreams, each for his own department, that all a king's ransom would be inadequate to make real. Of all this I wrote Mr. Clark and my colleagues here awaiting the great instauration. The harvest home-coming, with all these sheaves of suggestion and inspiration, marked the zenith of great expectation and of hope tiptoe on the mountain-top. For years and sometimes even yet, European savants who first heard of Worcester from me and have since known it only as the home of Clark University, seemed often, to our great embarrassment, to assume that many or most of the ideals that we then discussed together are now realized in this golden land of

promise, and rank us far above our own modest sense of our deserts.

If I came home slightly intoxicated with academic ideals, so were all of us in some degree, according to our temperament, but a reality that was sobering enough soon confronted us. I cannot enter here upon the details of our disappointments, culminating in the tragic hegira to Chicago and elsewhere of three-fifths of our faculty. If ever there was an academic tragedy, a *via crucis,* a veritable descent into Avernus, it was here. The story of these years has been carefully written out, with everybody heard from, and all the divergent interpretations of what occurred and what it meant faithfully set down, and filed away in our archives, and perhaps after another-twenty-five years or yet another, it may be published.

Suffice it to say that although we started with far less than, justifiably or not, we had hoped for, we began the fourth year, 1893-94, with only about one-fourth of the total annual resources that we had the first year. In the seven years that followed, down to the founder's death in 1900, we had for all purposes only 4% of the income of $600,000 plus that of $100,000 more for the library, that is, less than $30,000. Several of us who remained here were tempted by larger offers to what seemed more promising fields, but, on the whole, and I believe no one regrets it, we elected to stand by here. These lean years were, however, characterized by two features. First, they were years of unique harmony. There was no friction. We stood and worked shoulder to shoulder. And this is of prime importance in a small institution like this. In a great university discords can and always do occur, but here, where discontent in any department disturbs the whole institution, accord is one of the prime necessities. The other feature of these years was intense devotion to research and to teaching, and our productiveness, whether compared with our numbers or our income, has never been greater, and indeed, I wonder if that of any other institution has been greater relatively to its size. Perhaps the alumni of these days were, and will ever be, a little nearer to the center of the hearts of those who went through them, and it is significant, and can be no cause of jealousy to others, that it is they who are leading in the epoch-making activities that center about to-day and mark this as the date from which henceforth our alumni will be a potent factor in our future history. Their newly and well organized support, their enthusiasm for the spirit of research, which is our inspiration, will henceforth greatly reënforce all our best efforts here and be an inspiration to our future development.

With the dawn of the century came also the college, which has given us 51 students who have already taken degrees in

the last eight years, although it has its own independent purpose. As to it, we are brethren, children of the same parent or, to change the figure, a married couple, and unlike married couples we can never be divorced, so that he who would make discord between us is an enemy to both, and every man who helps the other is a friend to both. Any encroachment of each upon the other's domain or any effort to profit or exalt the one at the other's expense, is bringing discord into sacred family relations. Our two-in-one or dual unity is unique, delicate, imposes new responsibilities and presents also inspiring possibilities for a new solution of some of the highest academic problems. I think we can truly say that each is now a noble stimulus to the other. We are proud of the college and we are so just in proportion as we know and understand its problems, aspirations and achievements. We are proud of the name and the work of its first great president and of the rare men he brought here, whose growth in knowledge and power, together with those of the college alumni whom they trained in his day, constitute his living monument, and we of the university salute the college colors in our decorations to-day, and hail with pride and give our heartiest Godspeed to the second president of the college, who is not only carrying out the ideals he inherited of a three years' course of non-athletic and citizen-building functions, but is going further and making the college a leader and light among others in the land. Would some one would offer a prize for some pregnant symbol, seal or even slogan or song typifying this unique conjunction, which college and university should forever unite to use! Could we not fitly commemorate this occasion by a new resolve that there shall never be tension or strain between us, and that a policy of mutual help shall henceforth animate us both?

In the recent voluminous literature on colleges, so much under discussion of late, we have several characterizations of the ideal college professor, and these agree pretty well. He must be a good man, a model citizen, a gentleman and a scholar, a teacher born, made or both, tactful, and in close personal relations with his students, anxious and able to teach them all they are capable of learning in his department, a man whose character will be normative and influential for good, fitting students, not for the university, nor even for professional or technical careers chiefly, but for their work in life in general, and evoking all their powers. Noble as are all these traits of nature and nurture, and rare as is their combination, and exacting as are the conditions of instruction and parental care, many college professors go further and are not even content with the useful work of making text-books but really

add to the sum of human knowledge by their researches, and it is a satisfaction to us that so many of those here are with and of us in this respect.

For the university professor research is his prime function. He must specialize more sharply, must not only keep in constant and vital *rapport* with everything that every creative mind is doing in his field the world over, but he must hear and lay to heart every syllable that the muse of his department utters to every co-worker everywhere, and best of all, she must also speak new words through him. There is a vital sense in which he stands in closer relation to his co-workers in other lands than to his colleagues in the same institution. The chief momentum of the vital push-up in him impels him to penetrate ever a little farther into the unknown, to erect some kiosk in Kamtchatka, where he can wrest some new secret from the sphynx, who has far more to reveal than all she has yet told. Whenever he grows impotent to do this, he becomes only an emeritus knight of the holy ghost of science. Studies of the age when men in various departments do their best work show that scientists are the oldest of all the creators of culture values on the average, but that there is more individual variation, so that they cross the dead line both older and younger than any others. It is one of the hardest things in the world to be and remain a productive investigator. There are so many journals and books to be read, so many and constant alterations and adaptations, needful to press the questions we ask nature home and to get an answer, such changes of method and apparatus, so much that was yesterday new and will tomorrow be obsolete if we would not abandon what Janet calls *"la fonction du réelle,"* and take some kind of flight from reality and its ever pressing *devoir présent*. But if research is hard and the life it demands beset with dangers, so that many are always falling by the way without giving any sign of their demise to outsiders, this work has its supreme reward, and I cannot believe that there is any joy life has to offer quite so great as the Eureka joy of a new discovery.

Not only this work itself but its conditions are amazingly complex, unstable, and ever shifting. Just at present it seems to me that academic unrest was never quite so great the world over, and that the near future never promised so many important changes. Some abuses, great and small, have of late grown rank and demand remedy. Certain vicious tendencies must be corrected and reforms made. Bear with me if I ask you to glance briefly at a few of these.

Beginning with the Teutonic countries, since 1907 the assistant professors and docents have developed a strong inter-

institutional organization against the head or full professors. The unprecedentedly rapid growth in the size of the student body everywhere has resulted in what Eulenberg calls a lush "Nachwuchs" of assistants of all grades. Statistics show that on the average the *Extraordinarii* or assistant professors receive this appointment at the age of 37, at an average salary of $523, and remain in this position nearly 20 years, attaining an average salary of $1,200, before promotion, at the average age of 57. These now constitute, with the docents, about half the teaching personnel of German institutions, and they often have neither seat nor vote in the faculty and little participation in the corporate life of the institution. In the municipal university which opens at Frankfurt next fall it was even proposed to have a president of the American type, to safeguard the assistants against the oppression of the full professors. A few years ago Tübingen, and last year Zürich, radically revised their ancient statutes to remedy these evils, and the projected university at Hamburg will go yet further. The two new universities in Hungary, at Pressburg and Debreczen, and the private one at Hongkong,—these grant more liberty and show more appreciation of the enthusiasm and ideals of the younger members of the faculty. Even students in Germany have caught the spirit of unrest, if not revolution, and now have a strong inter-institutional organization, and their pamphlets are boldly demanding better methods of teaching, printed outlines of professors' lectures, are trying to develop a sentiment that no instructor shall ever repeat in a lecture anything he has ever published, are calling for more options, especially more freedom of choice in the selection of subjects for their theses and more meaty topics for them that do not make their work ancillary to that of the professor, more personal rights to what they produce or discover in them, a longer period of *hospitieren* or of trying out each course before they finally sign for it, more and better seminaries with better tests for admission, more practical courses, better access to books, journals and library facilities generally, less over-crowding and more elimination all the way from *Ober-Sekunda* in the *Gymnasium* to the doctorate, better social opportunities, dormitories, more personal contact with the professors, less restrictions on their personal liberty, reform of the corps, honor system, and the *Mensur*. This unrest, although it seems ominous to conservatism, cannot fail to prevent waste and bring reform.

In the English universities agitation has had many recent expressions, from Lord Curzon's demand for reforms in 1909 on to Tillgard's of last year. Here the protestants grant that these institutions still breed the flower of national life, the Eng-

lish gentleman, but demand better library facilities than the individual colleges, with their wasteful duplication, afford, and especially more of what the critics so strenuously insist is still lacking and that parliament should enforce, namely, more teaching and research. Thus the deepening sense that something rather radical must be done seems now crystallizing into just what that something should be. In France and in Russia unrest is greater and reforms are more loudly demanded.

In this country academic unrest has been largely directed against organization and administration. In old days the college president, though he usually taught, was supreme and autocratic, and as leading institutions grew and he ceased to teach, the concentration of power in his hands became altogether excessive. The foundation of new institutions, the Hopkins, and a little later Stanford and Chicago, greatly augmented his power under our system. He had to determine the departments, select professors, fix their status, build, organize, represent the institution to the board and public, perhaps the legislature, plunge into the mad, wasteful competition for students and money, lay supply pipes to every institution that could fit. Never was the presidential function so suddenly enlarged nor its power so great and uncontrolled as a decade or two ago. Even the University of Virginia and other southern universities, which had only a president of the faculty, elected by its members, fell into line, and a reaction toward democratization, which in its extreme form seemed sometimes almost to adopt a slogan, "*Delindus est prex*," was inevitable. In the Cattell movement abundant incidents of arrogance and arbitrary, if not usurped, power were collected, and it was even insisted that although charters or conditions of bequest, to say nothing of American tradition, would have to be reversed, it was urged that the president should be only chairman of the faculty, elected perhaps annually by them, and in the literature of this movement we find occasionally the radical plea that some or all of the powers of the board should be turned over to the faculty, who should at least be given control of the annual budget. More lately the movement of protest here is against the autocracy of the dean, whom the president had created in his own image, and who sometimes exercises a power that he would never dare to do, and who in large institutions has constructed a mechanism of rules, methods, procedures, standards, which have almost come to monopolize the deliberations of the Association of American Universities, which fortunately cannot prescribe or legislate for its individual members. University deans have often created rules which they themselves can suspend for individuals, and this has greatly augmented their power. It is they largely who have broken up knowledge into standard-

ized units of hours, weeks, terms, credits, blocking every short cut for superior minds and making a bureaucracy which represses personal initiative and legitimate ambition. Just now perhaps we hear most remonstrance against head professors and statements that the assistant professors and younger instructors in their departments are entirely at their mercy, that they are burdened with the drudgery of drills, examinations, markings, all at small pay, while their chiefs take the credit, so that the best years of the best young men, who are the most precious asset of any institution, or even of civilization, are wasted. Indeed we have vivid pictures of the hardships which often crush out the ambitions of young aspirants for professional honors and tend to make them, if they ever do arrive, parts of a machine with no ideals of what sacred academic freedom really means. Happily now the best sentiment of the best professors now organizing inter-institutionally to safeguard their own interests and those of their institutions, stands for a most wholesome and needed movement which is sure to prevail.

So far I submit to you and to my colleagues that Clark University, not through any wisdom or virtue of its president, although perhaps a little through the fact that he is a teacher and does not spend all his time in organizing, but owing to its small size, its unprecedented absence of rules, its utterly untrammeled academic freedom, is to-day in a position to lead and not follow in the wake of this movement. No one here wants autocratic personal power but we do all want the best attainable, whatever it is. Each department here is almost as independent and autonomous as if there were no other. We have no deans, few assistant professors, and so no tyranny of departmental heads, no complaints on the part of students, as in Germany, that we are not doing the best we can for them, so that this world-wide movement for academic reform we ought to consider as a great and new opportunity to us all, trustees and faculties, at this psychological moment to realize our own advantage, and to carefully look over our present system and see if we cannot use this opportunity to begin the new quarter century with our lamps retrimmed and burning bright, and alert and profiting by every suggestion that the academic *Zeitgeist* is now murmuring like the Socratic daemon in our ears.

Let us, then, look our present situation and ourselves frankly in the face. With the indefatigable labors of Senator Hoar in securing a just and legal execution of Mr. Clark's difficult will, labors which some of his colleagues in the board thought almost justified us in calling him our second founder, with a board more active and interested in our affairs, external and

internal, than ever before, as their coöperation in this commemoration typifies, with our funds better invested and yielding a trifle more than they have ever done, with an admirable library, the creation, body and soul, of Dr. Wilson, who has the greatest genius of friendship of us all, with the re-establishment of the department of chemistry, which was dropped for a few years, with the increase of salaries, from time to time, as far as means permitted, inadequate though most of these still are compared with the increased cost of living, with more departments and professors and instructors, we seem to have entered upon a settled period of prosperity and growth that promises that the next quarter of a century will far transcend the past, and now that all the perturbations of the first formative era are over, we can look forward with confidence that the university will go on in the general direction it has already so faithfully held to during its period of storm and stress, *in saecula saeculorum.*

We have no greater distinction than that which has come from always preferring quality, attainment and ability to numbers, and that these standards may never be lowered is the most heartfelt wish and prayer of all of us. My greatest joy today is in the spontaneous testimonials of appreciation and loyalty of our alumni in leaving their work and coming here, at this most inconvenient season and sometimes from a great distance, and giving us or wording their cordial personal greeting and Godspeed, and even in contributing, not out of their abundance, for most of them are moderately paid professors like ourselves, but from a sense of gratitude and as a token of good will, to the fellowships which constitute our very greatest need.

Turning to the future, the changes we need here are largely but by no means wholly in harvesting what we sowed at the start and assiduously cultivated ever since, for which the time is now ripe. It would be preposterous to lay out our course now for another quarter century. We must always maintain keen orientation in an ever wider and more intricate field. To my mind there should always be a specialist here and in every institution in what might be called the higher pedagogy and in academic history, whose business it is to keep keenly alive to all that is doing in academic life the world over. Especially now, when these changes are so rapid, some one must spend much time in the outlook tower, and I would even hazard the strong opinion that had foreign institutions had a specialist in the conning tower, intent on studying the ever changing signs of the times and trained in academic statesmanship, many, if not most, of the errors that have

caused our own and foreign universities so much waste of energy in recent years, might have been avoided.

The time is at hand when university rectorates, presidencies, chancellorships, or whatever their name, can no longer be filled by any professor or even outsider who can secure election, but will require men who, whatever else they are or know, are experts in the history of the higher culture and its institutions, from the four great academies of antiquity down, who know the story of mediaeval universities of the church and then of the state, of the guilds of scholars, the rise and present status of learned societies and academies, the great reforms of the past and the yet more significant reconstructions now evolving, the governmental patronage of learning and research, from the day of the Medici down to contemporary legislation for higher institutions, national and state, present-day centralization and the efforts against it in France, the many universities lately established by colonial policies, the world-wide movement of university extension. He must suggest ways and means to his colleagues for achieving their own even if unconscious ideals, help free investigators to be the supermen they are called to be, each in his own way, have a minimum of arbitrary authority and a maximum of faculty coöperation, catch and sympathetically respond to and find his chief inspiration in the fondest, highest, if secret, aspirations of each of his co-workers, who must not be content with the stale ways of the present perfervid competition for dollars and students or with the mere horizontal expansion, the multiplication of machinery or devices for efficiency of factory type, but study precedents, culture trends, and believe profoundly in the power of faculty democratization and do his utmost to develop it, regardless of his own personal or official prestige or authority. On the continent, mayors are trained professional experts, and cities vie with each other competitively for their services and find they can well afford to do so, for their special training means vast economies. Universities in this country if not the world over, are more nearly ready than are cities to profit by this example, and their gain thereby would be even greater. Twenty years ago Professor Paulsen of Berlin, the best representative of the higher pedagogy I plead for which that country has yet produced, warned German universities of the very dangers which have now waxed so grave, and with which they are battling, and the presidents here have only too good reason to look either with jealousy or with hope, according to their temperament, upon the now rapid addition of the higher story of academic pedagogy to the old schoolmaster's pedagogy of the grammar and high school, and development in this direction is another of the pregnant signs of the future.

Think of the changes since we began. Many special lines of research have their own institutions where little or no formal teaching is done, like astronomic observatories, the Rockerfeller Institute, Wood's Holl, Cold Springs Harbor, the Carnegie Institute, with all the possibilities of his will, the question of a national university, always with us, just now of the Fess hundred million dollar type, to be devoted chiefly to research, the enormous expansion of teacher-training in nearly every higher institution of this country, a movement that is almost without precedent in its magnitude and suddenness, the augmented stress laid upon practical applications of pure science,—these constitute a new environment, as also do the active and well organized but silent field agencies of most large institutions both to recruit students, with competing agents at the ear of every boy who thinks of going on, and also to place their graduates in every academic vacancy. These are problems to which a presidential or other agency must give great and growing attention and for which the president of the future must have special training, and in which also the faculty must share the burdens of administrative responsibility since questions must often be decided one way or the other while those who determine them are uncertain, themselves, so that criticism accumulates.

As to professors, the best of them make an almost unprecedented sacrifice and could have achieved the highest success in financial, professional, political (witness President Wilson) and other lines. They know the price they pay and are willing to pay it, but must have as their compensation the boon of security and liberty to teach and investigate freely what and how they will. The university professorate, too, means not only the cult of specialization but of individuality. Even idiosyncrasies are to be not only tolerated but respected and perhaps welcomed. The university should be the freest spot on earth, where human nature in its most variegated and acuminated types can blossom and bear fruit. The factory type of efficiency has no place there. Each must make himself as efficient as possible but in his own way and independently of all external circumstances, and without the multiplication of machinery, so that an able organizer with nothing to do but to administer might prove an unmitigated curse to all the best things a professor and even a university stand for.

Thus now I, who with one tiny exception have never, during all these twenty-five years, to a single citizen of Worcester hinted at a donation, will say a word which I wish all would hear and consider. We greatly need and shall always need more funds to strengthen existing and to found new departments. Though we bear another name, we are,

fellow citizens, your University of Worcester. In all the spheres we touch, we have spread the name and added to the fame of this Heart of the Commonwealth. If we had ten million dollars more, not one of us would gain personally but should only have more work, for we are only administering the highest of charities.

If you doubt that this is the highest, listen to the conclusion of the report of the most elaborate parliamentary commission Great Britain ever knew, of forty volumes and nearly nineteen years in the making, covering all British charities of every kind, more than twenty thousand in all, which is: that of all objects of charity, the highest education has proven wisest, best, and most efficient of all, and that for two chief reasons, first because the superior integrity and ability of the trustees who consent to administer such funds, together with the intelligent appreciation of those aided by them, combine to furnish the best guarantee that they will be kept perpetually administered in the purpose and spirit of the founder whose name they bear; and second, because in approving higher education all other good causes are most effectually aided. Since the first endowment of research in the Greek academy, porch, grove and garden, from which all our higher institutions have sprung, thousands of spontaneous free will offerings have borne tangible witness to the sentiment so often and vividly taught by Plato, that in all the world there is no object more worthy of reverence, love and service, and none that it pays a civilization better to help to its fullest development than well-born, well-bred, gifted, trained young men who desire to be masters in an age when experts decide all things, for in them is the hope and the future leadership of the race, and to help them to more of the knowledge that is power is the highest service of one generation to the next. And how this has appealed to all ages! Oxford and Cambridge have 1,800 separate endowed fellowships and scholarships, to say nothing of the smaller exhibitions. Leipzig has 407 distinct funds, the oldest dating 1325, and wherever the higher academic life has flourished we find scores of memorials bearing the names of husbands, wives, parents, children, and providing for students of some special class, locality, or establishing or benefiting some new department or line of investigation, theoretical or practical; and now that the *rapport* of business, government, and all social and cultural institutions was never so close, all who give greatly and wisely, or who make or suggest bequests, have a new *noblesse oblige* to consider.

Cold facts and figures finally show a few things that I beg you all to ponder now. These are, that compared either with

the size of our faculty, the number of departments, or our annual budget, we have fitted more men for higher degrees, seen more of them in academic chairs, where they are found in all the leading institutions of the land, including some dozen of presidencies, first and last, published more original contributions which seek to add to the sum of the world's knowledge, have a larger proportion of members of our faculty starred as of first rank in Cattell's census of the competent, had closer personal and often daily contact with students, and given more individual help outside of classes, had more academic freedom (for no one in our history has ever suffered in any way for his opinions), had more autonomy in our departments, each of which is a law to itself, had less rules and formalities of every kind, and had a president who was less president and more teacher, good or bad, spent less time in devising ways and means of seeking contributions from our friends here, advertised less and avoided all publicity more, until now, when I am, just for this one moment, throwing all our traditions of silence, modesty, absence of boasting about our work, to the winds. In these respects we exceed any of the other twenty-one institutions of the Association of American Universities.

This Clark University means, has stood for and will forever stand for, and this is why we all love and have put the best twenty-five years of our lives into her service and wish we all had another quarter of a century to serve her better, This is what brings you alumni back with your offerings, your loyalty and hearty good wishes. This is the university not made with hands, eternal in the world of science and learning. Clark University is not a structure but it is a state of mind, for wherever these ideals reign Clark men are at home, and all who have them are our friends and brothers.

It is this ideal that sustained us in our darkest days and now lights up the future with a new glow. Is there any joy of service to be compared with that of the investigator who has wrung a new secret from the heart of nature, listening when she has whispered a single syllable of truth unuttered before, who has been able to add a single stone to the great temple of learning, the noblest of all the structures ever reared by man? Is there any more religious calling than thus thinking God's thoughts after him, and proclaiming the gospel of truth to confirm faith, prevent illness, deepen self-knowledge and that of society, industry, give us mastery over the physical, chemical, biological energies that control the world, and develop mathematics, the language of all who think exactly, a language which all sciences tend to speak in proportion as they become complete? This is why research is religious and

the knowledge gained in the laboratory to-day may set free energies that benefit the whole race to-morrow. Is not an institution devoted, heart and soul, to this sort of work, the best thing any community can have in its midst, and should it not be cherished as the heart of this "Heart of the Commonwealth?"

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SOME PSYCHOLOGICAL ASPECTS OF TEACHING MODERN LANGUAGES

By G. Stanley Hall

(Address at the meeting of the New England Modern Language Association, Boston, Saturday, May 9, 1914.)

After accepting the invitation to read this very slight paper with which your president honored me, a sense of my temerity has come home to me to a somewhat acute degree. I began academic teaching, I would have you know, as a professor of French, German and English language and literature, and continued for a whole year until I was demoted to the department of psychology, but I cannot find that I knew, taught or learned anything of pedagogic value about it. I also spent six years on the continent and acquired a certain practical knowledge of several languages, but just how I do not know, and this experience gave me little insight into pedagogic principles. Every few years I give a course of lectures on the psychology of language but here there is very little common ground with Flagstad, nor do I find that the few pieces of laboratory work in phonetics nor the clinical studies of aphasia, nor the development of speech in children, shed a great deal of light upon your practical problems. With this array of disqualifications, I can only fall back on a few general principles that touch your work only here and there, but which seem to me to be psychologically justified, and these I will briefly tab off in the hope that you will set me right if I am wrong, as follows.

1. To me it seems clear that if there is to be instruction in modern foreign language the age of about ten is for most children the best to begin it. If it comes before this the child has not developed sufficient *Sprachgefühl* for his *own* language, has not developed sufficient idiomatic sense of it to avoid the danger of interference, if we assume, as I am inclined to with P. G. Hamerton, that one language must always lead and that few, if any, can command more than one equally well. If we begin later the work is complicated with the phenomenon of mutation or change of voice, after which the vocal organs distinctly lose plasticity for new sounds and the ear for new discriminations. Thus with the dawn of puberty certain linguistic possibilities are lost beyond the power of

retrieval. This I think is the consensus of the competent on the continent and most here realize that we begin too late.

2. It seems to me that what is sometimes called the Frankfort plan, which insists that the study of a living must precede that of a dead language, has almost every pedagogic consideration in its favor. If Latin has preceded of course the old grammatical method has a little more justification, and should be utilized for all it is worth, but for direct or even natural methods the living language, with its vital interests and points of contact, ought to lead and perhaps set the pace and the fashions for the study of ancient languages if they are to follow.

3. I think all that we know of childhood confirms the theory that only one alien language should be taught at once, or at any rate that there should be a two or three year interval before a second is stressed. These three points seem to me so obvious that I leave them with bare mention and pass to the fourth principle, that the phonic emphasis of the Viëtor School brings, a new principle of great efficiency.

Language lives in the mouth, and a certain mouth consciousness, readiness in making and discriminating with the ear fine distinctions, hearing and especially pronouncing correctly and with a good voice not only give confidence but vitality to everything that follows. It is of course not necessary for the teacher to go into all the fine distinctions that glottology or the physiology of the vocal organs now lays down, but careful and discriminating well vocalized and well intoned pronunciation and much of it vitalizes everything, lays the stress where it belongs, and not only avoids both slovenly and also affected utterance but is a wholesome corrective of the misleading influences of our often fantastic, irrational and archaic spelling, and sets a standard which gives even the speech music of talking and listening to it a charm of its own. This method is a little like applying a microscope to a word. It gives it more individuality and opens wider and smooths the ways in which the soul wreaks itself upon expression. Utterance is the soul of speech, and motor control, which is the basis of every sort of efferent activity, culminates in correct vocalization. Compared with this, reading and writing are very late and long-circuit processes which distract and divert, so that hand and eye work, to which teachers are far too prone, tend to be duly subordinated. The phonograph can be a real help. Moreover, a sense of being able to pronounce correctly not only gives pleasure and confidence but sets up a standard which later favors idiomatic correctness and unquestionably greatly reënforces *Sprachgefühl.* Thus it seems to me one of the

best tests of efficiency in teaching modern languages is how much of the total energy put into the work from the very first is vocal provided that vocalization be correct. In French and German schools I have seen drill on phonic charts and in one case even a fantastic nomenclature of sounds ("th" in "thin" called a lingual dental hisser, as distinct from "th" in "the" dubbed a lingual dental hummer). Yet it seems to me that despite constant dangers of over-refinement this method, if not carried to extreme, has justified itself and opened a new resource of which early teachers of modern language had little conception.

5. As to the value of accessory factors, these are of course very great, especially with the young, and first among them we must place reading and writing and all eye and hand work, which should be subordinated at first and come to their own rather slowly. As to reënforcement by pictures and objects, this is of course of the greatest value, and should be cultivated to the uttermost. The sight of a thing or act often brings up a forgotten word-image, and all the aphasias show the most intimate connection between the visual and auditory speech centers. I have been impressed with the two German chart systems made on the principle that everything possible spoken of in a foreign language should have at the same time a visual reënforcement because we cannot hold a word by too many associations, and the written image must in the early stages at least never get between the object or act and the spoken word. The Gouin principle of doing no doubt brings a reënforcement, but whether greater or less than that from the optical centers I do not think we can yet say. It certainly has its value independent of his series theory. To say, "*Ich wasche meine Hände*" and do it at the same time before the class means irradiation and a new *Bahnung* or facilitization in the brain and is unquestionably one important element in the psychological constellation which constitutes a real vital word. To this view it has been objected that in aphasias we often see *e. g.* a shoemaker who while he can talk glibly of politics, religion and other things, has lost the use of words like awl, leather, shoe, because by the use of these the manual centers have superseded those of speech; and so of the carpenter who has lost only the power to speak of his tools, wood and the things he makes. But this does not, as is sometimes urged, constitute an objection to deriving all possible help from activities in a process of learning a language, any more than the fact that in disease meanings are often totally divorced from words is an argument against unifying these early and intensively with the word. We must not forget that the complete acquisition of a word, *e. g.*, bell

(*Glocke*), does involve visual, auditory, manual and ideational centers that are distinct even in their localization. In its higher ranges this principle means great stress on *realia* such as is to a great extent impossible in teaching a dead language, so that every contact with living reality is like Antaeus' vital touch of Mother Earth. The method of having each pupil in this country put into correspondence with a German or a French child, every contemporary allusion to French or German literature, life, pictures, history, politics, reënforces because interest, content, meaning, is the muse as soon as the rudiments are passed. The Schiller Theatre in Berlin, for instance, which gives English and French plays free to children who have attained a certain mark in reading the play in school (which theatre is a part of the school system), works on this principle. Precisely as in teaching English the very most real progress is made when the child is utterly absorbed in the thing itself, so in learning a foreign language the prime function of all the learning processes is genuine zest, curiosity, desire to know and feel things of which the language is the only medium. That is why it seems to me that the classic works of the great French and German dramatists are a little too advanced for high school youth, that absorbing things on their own plane would be far better, and that is why when interest in a story, for instance, is intense, it is almost a pedagogic crime to hold up the children's impetuous zest to read on and see how the story ends by impertinent questions of grammatical construction or historical allusion or any of the irrelevancies that make up the often too vast body of notes in our textbooks. That is why the question of just what to read in French, German or Italian seems to me to be a question we have generally not solved aright. If we only had a scale on which to measure interest in content, then we should realize that the common life of the people, that connected incidents focussing to a denouement which touch fear, hope, love, and all the deeper, stronger emotions in which children are far more like adults than in their intellect, should be the determining factor in selection. How many incidents students of childhood and youth could adduce where an intense interest even in plays, games, in adventure, hunting, sea-life, and in older people a predominant interest in a specialty, proved an inspiring muse that has led its votary by leaps and bounds to a practical knowledge of a language! I have known several bright university students who in the preparation of their theses had to get something vital to their theme in Italian, of which they knew nothing, but whose interest was so great that in a surprisingly short time they mastered, not to be sure the language, but enough

of it to get the content of articles and even books essential to their theme. I have an impression that modern language teachers need to revise the matter which they give to both high school and college pupils and that if they would utilize to the utmost this supreme impulsion of education, interest, they would be surprised to see how much faster their pupils' progress would be. We had for years an instructor who met our graduate students in each department who were lame in their modern languages and read only things in which they had an intense interest, often coaching individuals and helping them through memoirs they had to know for their doctors' theses, and progress in the facility of getting what they wanted in this way has almost always been remarkable. Method has its place I believe here as in every other department, but we teachers tend to magnify its importance and fail to see that it is always ancillary to the end, and the textbooks here as everywhere tend to make the teacher so method-conscious, so intent on his own way of synthesis and analysis that the pupil in the end is too conscious of the logical because the importance of the psychological, which is a very different thing, has been obscured.

6. As to the direct method, is it well, especially considering the late age at which most in this country begin the study of a foreign language, to affect the attitude of infancy, as if no other language was known? If the student knows anything of Latin it would be surely wasteful not to allow him to utilize the knowledge of both its grammar and etymology in studying French, and why as he already knows English should he not utilize all of it he can at the start? Perhaps it might be different if he were beginning to learn a tongue of a totally different linguistic stock like an agglutinative Mongolian tongue, but when we consider that English, French and German are relatives with the same parent, with differences that are only specific and not generic, it would seem that any modern language should at first lean as heavily as it can upon the vernacular. *Sprachgefühl,* if indeed it means anything, designates a sense or feeling of one particular tongue as distinct from another. Is there a special feeling for German, French or Italian, a genius of each of these tongues? If so it is not a simple but extremely complex constellation of special feelings that has to be very slowly built up and is not at all like a muse that presides over and inspires work from the first. One component of it is embodied in idioms, and these are many and slowly learned. Another component of it is found in words that cannot be translated without considerable loss of meaning in the process of decanting from one tongue to another. Another is the peculiar sentence sense,

the persistent governing power of prepositions, of split verbs and the other manifold bonds that connect all the phrases or grammatical elements of a sentence with the rest and constitute periodicity. Another is the speech music of pronunciation, which is somewhat different for each tongue. Yet another consists of figures of speech the tropical power of which is now more, now less submerged to consciousness and conventionalized. Another is made up of the unique vocal sounds and combinations peculiar to each tongue, and there are countless others. These are all separate and each one of them is very gradually evolved, and their synthesis into the whole comes later yet. Much of the difference between the *Sprachgefühl* of one tongue and that of another consists only in a different emphasis on elements common to both rather than in those that have no analogy with anything in another tongue. Again, speech, no matter in what tongue, has the same brain centers and uses the same organs. In the various speech diseases or aphasias the different sensory, motor and ideational elements may be struck out by cerebral lesion, showing the intricate and composite structure, but no disease ever destroyed the power to speak one language and left the power to speak others intact, and this shows that between different languages differences are very slight from a psychophysic standpoint compared with the differences between the elements of the same language. I think any expert introspector, no matter how accomplished a bilinguist he may be, will admit that the two tongues he commands are always like two horses unevenly matched, where one draws most of the load and is the leader and a little ahead. If two languages were entirely independent and the *Sprachgefühl* of one was separated by a watertight compartment from that of the other, there is every reason to believe that a new language would weaken our hold upon the vernacular, when in point of fact it should strengthen the other. Of course there are always untranslatable phrases in one language, but probably no more than there are sounds in one peculiar to another, and who would say that we should ignore such phonic elements as our own language contains in building up a new one? For myself I have spoken and especially read as much if not more German in the last twenty-five years in my own specialty than I have English, and I read rapidly and fluently, but introspection always reveals to me a very active if almost unconscious translating devil that is always very busy getting the meaning over into English thought, and for the most part phrase, and until this is done I do not hold the content by so firm a tenure. Thus the *Sprachgefühl* of the vernacular is always at work metamorphosing and recasting not merely

thought but phrases, although I fully recognize at least in my own special department the distinct connotations of the foreign words from those usually thought to be their equivalent in English. In the kind of thinking that I do most of, viz., psychological, no matter what language I read I think nine-tenths or more of it in English, and the tenth that has no exact equivalent in English I treat a good deal as if it were additions to my English vocabulary. Once more, if the direct method involves a new beginning then we should profit to the uttermost by the now quite extensive knowledge we have of how children learn their mother tongue. Of the very many child vocabularies there are now common features enough to guide us to a vocabulary in the foreign tongue that would have a genetic presupposition from the foreign source in its favor. There are very characteristic constructions and errors of many sorts are inseparable from the process of learning the mother tongue, and yet these errors are part of nature's way. There is a rather constant proportion of nouns, verbs, adjectives, forms of construction that are characteristic of beginners, and this genetic, which is very distinct from the logical method, is the one that should be followed in a method that is severely direct, and certainly talking on this principle long precedes reading and writing. Hence it is really psychologically impossible for an adult to approach a new language independently of every support which his present knowledge of the vernacular or any other tongue, ancient or modern, can afford him.

Finally, I have less and less respect for all hyper-methodic ways of learning a new language, because however subtle they may be, the ways of nature are indefinitely more subtle and complex. I think psychologists interested in the psychology of speech can regard the pedagogic methodizations that often loom so imposingly here as cheap and superficial. Unquestionably all the newer ways have helped to make modern language teaching more efficient than it used to be, and the impulses given in this field by Sauveur, Berlitz and now Viëtor and Wolter, have all contributed, so that to my mind the ideal for the teacher to strive toward is to know all enough to use the best elements of them all by turns, but to resist extremists who insist that there is only one best way and who would tie them down to any inexorable and exclusive method, although an enthusiast in any does often accomplish marvels. I would also have every teacher have certain specific devices of his own, and especially his own centers of interest, with which he should try to infect the class, but with all this the center of this work, it seems to me, must forever be drill, practice, repetition, work in season and out

of season, and yet as in everything else the muse which alone can make even drudgery attractive is interest. Every teacher who can generate an interest in things French, German, Italian, breaks down the resistance which the most willing pupils unconsciously offer to the acquisition of new skills.

We are and have been, as Handschin's conspective sketch shows, slow and backward in teaching and learning foreign tongues. With the size, the isolation of the country so unlike that of crowded Europe, in many parts of which one must speak, and in every part of which it is more necessary to speak other languages than the vernacular, this backwardness was inevitable. It has gone with a certain provincialism that has characterized our national spirit. Our ignorance and lack of appreciation of things foreign is both cause and effect of our complacency with a knowledge of only one tongue. Even our foreign policy, not to mention here our consular and diplomatic service and our trade, has suffered incalculably as compared, for instance, with the Germans, because of this provincialism of which the sad, though on the whole rather brightening statistics of our ignorance of languages is little more than an index, but is a part. Our whole attitude towards all Latin America south of the Rio Grande is more vitally than we think connected with the fact that in the north and east parts of the country at least we know almost nothing of Spanish. Let us hope that having as a country so recently entered into the great family of nations with world-wide interests, we shall now qualify for this new rôle and inoculate the million young people in our secondary and academic education with the spirit of other great contemporary nations, not merely with the grammar and vocabulary of these lands, but make them feel their life, share their aspirations, understand their points of view, and thus strengthen fraternal bonds and increase the motives of peace and good will between them and us.

A CLASSIFICATION OF UNIVERSITIES AND COLLEGES IN JAPAN AS COMPARED WITH THE UNIVERSITIES OF THE UNITED STATES

By Yoshi S. Kuno

It is almost impossible to classify the Universities and Colleges in Japan under the four classes as defined by Professor Kendrick C. Babcock in his "A Classification of Universities and Colleges with Reference to the Bachelor's Degree," because their organization is so different from those in the United States. I have therefore prepared this paper by first defining and explaining each type of higher institution in Japan and then classifying them by following Prof. Babcock's plan as closely as practical. In collecting data I have made extensive use of the 38th Annual Report on Japanese Schools, issued by the Department of Education of the Government of Japan in 1912.

All students desiring to enter higher institutions of learning are educated uniformly during the first eleven years: viz., six years in the Elementary School and five years in the Middle School. Then they are free to matriculate in institutions of different kinds according to their aims and means. Some students now enter immediately a professional or technical school such as The Higher School of Commerce or Higher School of Technology, etc., as enumerated in Class 3, and begin their Collegiate work. Students intending to pursue a University Course are obliged to study for three years longer in The Higher School, where they pursue higher secondary education, or to study for a year and one-half or two in a preparatory department in a private university, in case they do not aspire to attend an Imperial University.

Japanese Universities and Colleges may therefore be divided into three different classes according to their standing and the amount of higher secondary education required for admission. They are (1) The Government Imperial Universities; (2) Private Universities; (3) Technical and Professional Schools of the standing of the Higher Schools.

Class 1. To graduate from a Government Imperial University with a Bachelor's Degree, the work in the following schools must be completed:

	Years
1 Elementary School (Zinjō Shō-gakkō)	6
2. Middle School (Chū-gakkō)	5
3. Higher School (Kōtō-gakkō)	3
4. Imperial University (Tei-Koku Dai-gaku)	3
	17

The reason why it is necessary for a Japanese student to spend 17 instead of 16 years as does the student in America to obtain a University degree is because of the difficulty of studying so many languages, it being necessary to study in addition to modern European languages, the Japanese spoken languages and the Japanese and Chinese classics.

Class 2. To graduate with a Bachelor's degree from a private university such as Waseda or Keio, it requires 15½ or 16 years, as follows:

	Years
1. Elementary School (Zinjō Shō-gakkō)	6
2. Middle School (Chu-gakkō)	5
3. Preparatory Department (Kōtō-Yoka)	1½–2
4. Private University (Shiryu-Dai-gaku)	3
	15½–16

Comparing these figures with those of the Government Imperial Universities, we find that a student can graduate with a Bachelor's degree in 1½ years' less time from Waseda and in 1 year's less time from Keio. This is the reason why the Government Imperial Universities do not consider the private universities of equal rank with them and do not admit their graduates to post-graduate work in the Government Imperial Universities.

Class 3. To graduate from one of the Technical or Professional Schools of the Higher School standing requires 14 years, as follows:

	Years
1. Elementary School (Zinjō Shō-gakkō)	6
2. Middle School (Chu-gakkō)	5
3. Technical or Professional School (Zitsugyo gakkō)	3

Although some institutions of this type have a one year preparatory course, yet most of them admit graduates from the Middle School immediately to college work. Although the names of these schools are often translated into English as "Colleges," yet the Japanese government does not recognize them as such but classifies them as "Schools of Industrial and Practical Knowledge," and does not allow them to confer the Bachelor's degree. However, there is one exception; that is

"The Tokyo Higher School of Commerce" which has been permitted by the government to establish a two years' graduate course and to confer the Bachelor's degree upon the completion of this.

In order to accurately compare the Universities and Colleges of Japan with those of the United States, the Middle Schools and the Higher Schools in Japan should be clearly defined. In the first place, there is no school in Japan, the standing of which corresponds to that of the High School in the United States. The Middle School in Japan is practically equivalent to the Introductory High in America with the addition of two years' work particularly devoted to the study of languages and mathematics. During these five years, the students are able to complete the work of the Introductory High, all secondary school work required in mathematics, and about one-half of the other work given in the American High School.

In the Japanese Higher School, the student completes the work given in the American High School together with most of the work given in American universities during the Freshman and Sophomore years.

In the Japanese University, the course includes work corresponding to upper division work in the American University together with such lower division courses as are too specialized to permit of their being given in the Higher School.

Taking all these facts into consideration, and taking Class I of American Universities as a standard, Japanese higher institutions may be classified as follows: to make the status of the university more clear, the number of students enrolled and the annual running expense are given in connection with each institution.

CLASS I

	No. of Students	Annual Expense
1. Kyoto Imp. Univ.	1,375	$565,400
2. Tokyo Imp. Univ.	4,670	752,700
3. Kyushu Imp. Univ. (in process of organization)		
4. Tohoku Imp. Univ. (in process of organization)		
5. Grad. Dept. in the Tokyo Higher School of Commerce. Number of students and expense given under the heading of Tokyo Higher School of Commerce.		

The institutions above mentioned are fully equal in grade to Class I of American Universities. Their graduates may be admitted to the graduate schools of Class I Universities as candidates for the Master's degree with the privilege of receiving the same upon completion of one year's graduate work.

CLASS 2

	No. of Students	Annual Expense
1. Doshisha Univ.	46	$11,700
2. Keio Univ.	2,112	41,400
3. Waseda Univ.	3,989	93,200
4. Sapporo Agriculture College	793	129,100

The standard of Sapporo College has been raised and the college no longer exists as a college, but it has been consolidated into a department of the Imperial Tohoku University.

Note: The amount given for Doshisha apparently includes some temporary expense, although the report does not so state.

Graduates from these Class 2 institutions lack a year or a year and one-half of the education received by graduates of the Imperial Universities. Therefore, these graduates may be admitted as post graduates with the privilege of becoming candidates for the Bachelor's degree as specified on page 57 of the University of California Bulletin, Vol. 5, No. 10, issued April, 1912, or as candidates for the Master's degree upon the completion of two full years' work.

CLASS 3

	No. of Students	Annual Expense
1. Aoyama Gakuin Col.	89	$2,700
2. Chuo Univ.	994	27,400
3. Hiroshima Higher Nor. Sch.	437	81.200
4. Hosei Univ.	675	15,200
5. Kagoshima Higher Sch. of Agriculture & Forestry.	120	21,400
6. Kansei Gakuin Univ.	665	7,300
7. Kumamoto Higher Sch. of Technology	280	34,300
8. Kyoto Higher Sch. of Technology	253	32,100
9. Kobe Higher Sch. of Commerce	543	35,300
10. Kyoto Hosei Univ.	152	4,500
11. Meiji Gakuin Col.	160	7,500
12. Meiji Univ.	1,566	18,500
13. Morioka Higher Sch. of Agriculture & Forestry.	262	34,100
14. Nara Woman's Higher Normal School	150	32,700
15. Nagasaki Higher Sch. of Commerce	374	31,700
16. Nagoya Higher Sch. of Technology	309	42,500
17. Osaka Higher Sch. of Technology	600	58,600
18. Osaka Higher Sch. of Commerce	295	26,200
19. Osaka City Sch. of Tech.	252	23,900
20. Okura Sch. of Commerce	470	16,700
21. Rikkyo Gakuin Univ.	61	3,200
22. Sendai Higher Sch. of Technology	429	43,300
23. Senshu Univ.	347	10,100
24. Tohoku Gakuin	22	4,400
25. Tokyo Higher Sch. of Agriculture	290	6,400
26. Tokyo Higher Sch. of Commerce	1,485	60,200
27. Tokyo Higher Normal	656	106,500

CLASS 3—*Continued*

	No. of Students	Annual Expense
28. Tokyo Higher Sch. of Technology	792	88,500
29. Tokyo Woman's Higher Normal School	356	61,400
30. Tokyo School of Foreign Language	659	42,900
31. Toyo Kyo Kwai College	236	3,700
32. Toyo Univ.	176	6,400
33. Woman's English College	105	5,000
34. Woman's Univ. (Nippon)	324	28,000
35. Yamaguchi Higher Sch. of Commerce	359	33,400
36. Yonezawa Higher Sch. of Technology	41	11,400
37. Nippon University	1,409	16,100
38. Shiryu Meiji College	93	31,900

The institutions of Class 3 are Government Professional and Technical Schools of Higher School standing, and also private universities and colleges, the support of which is insufficient and the standing poor. Their graduates should by no means be permitted to register as candidates for the Master's degree. As the expense column shows, the government Higher Schools have far more adequate appropriations than the private universities and colleges. But, on account of the lower standard of education in these Higher Schools the government will not permit them to confer any Bachelor's degree. Only the Tokyo Higher School of Commerce has a special provision by which the Bachelor's degree may be given, as mentioned above, upon the completion of two additional years of graduate work. Therefore, graduates from Class 3 institutions may be admitted to the University of California with the privilege of becoming candidates for the Bachelor's degree upon the completion of two or three years' undergraduate work in the University. In past years, the University of California has admitted graduates from these institutions as Special students in the undergraduate course. After they had demonstrated their ability to carry university work, the University gave them due credit. This worked very satisfactorily and seems to be the most advisable.

"THE MARKING SYSTEM IN THEORY"

By Edwin G. Boring
Cornell University

The last ten years have seen the publication, in educational and scientific journals, of more than a dozen papers dealing with proposed reforms of the systems of marking now generally followed in colleges and universities. The writers advocate, for the most part, an assignment of marks in accordance with some theoretical principle. The awakening of teachers to the need for a real understanding of the basis upon which grades are assigned is, indeed, most desirable; and it appears, from the instances in which one or other of the new systems has already been adopted, as if reforms were about to be realized. It is, however, all the more important that every new proposal should be subjected to the most careful scrutiny. If the aim of our reform is to avoid injustice, we must be eagerly zealous to avoid any new injustice inherent in the reform itself.

One of the most recent and definite proposals for the alteration of the present scheme of grading has been put forward by I. E. Finkelstein in a book entitled, *The Marking System in Theory and Practice*.[1] The work presents a large body of facts, methodically arranged, which furnish a powerful argument for reform. Its final plea is, however, for the establishment of a system of marking, in which the quality graded shall be assumed to be distributed in accordance with a frequency curve that is skewed[2] toward the upper end of the marking

[1] *Educational Psychology Monographs*, Baltimore, 1913.

[2] Finkelstein's notion of 'skewness' is not altogether clear. If he intends his mention of a "skewed curve with the mode to the right of the middle of the abscissa" (p. 16) as a definition, we are probably to understand that a curve is skewed in the direction in which the mode is displaced. Without any previous mention of skewness at all, he presents a figure in which the curve is said to be "obviously skewed to the left" (p. 12); but obviousness is scarcely a rigid criterion. What, for example, is to be said of the curve figured in this article? In it the mode is "in the middle of the abscissa,"—that is to say, the mode and the median coincide. For Finkelstein the curve would not be skewed. For E. L. Thorndike (*Theory of Mental and Social Measurements*, 1913, p. 77), however, this curve would be skewed, since, by the "approved" formula, skewness depends upon the deviation of the median from the average.

scale. As the assumption is open to criticism, and as the whole question of marking is of importance at the present time, a critical examination seems warranted. Finkelstein advances four arguments in behalf of his special contention (pp. 11-16). We propose to take them up in order.

(1) It is this author's first task to show that "the elimination of the academically unfit by the mill of the public school system does not produce a distribution like that of *Fig. B* [which is skewed toward the left, *i. e.*, toward the lesser degrees of ability], but leaves us, after all, the form of distribution shown in *Fig. A* [which is the normal frequency surface]" (p. 14). Finkelstein thinks that, if there were an elimination of those lowest in ability, the natural result would be a lopping off of the left portion of the curve, resulting in a skew in that direction.

He first quotes Judd[3] to show that "the elimination is not so severe . . . as is often supposed." "A study of the large high schools in the city of Chicago in its relation to the University of Chicago," he quotes, "shows that students go to college from every level of scholarship above the passing mark." But it should be noted that the boundary is 'the passing mark;' *some,* therefore, are eliminated. In the passage quoted, Judd is arguing, not that colleges admit inferior individuals, but merely that they admit mediocre ones, that there is not a high degree of selection: "It is not likely to be true that any institution will draw sharp lines of college admission or will attempt to maintain standards which exclude the mediocre student."

After Judd, Meyer is cited.[4] "College teachers usually assert that the curve of distribution is not the normal curve, but a skewed curve . . . They are usually ready to explain this by referring to the elimination of poor scholars in the high schools and lower schools. I have considerable doubts

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Further, it is important to note that Finkelstein uses 'skewness' in exactly the opposite sense to Thorndike (*cf. ibid.,* p. 33; or the earlier edition, 1904, p. 31, which was available to Finkelstein). Finkelstein's curve, which is "obviously skewed to the left," would be said by Thorndike to be "skewed toward" the right, and the formula for skewness is consistent with this latter view. In order to avoid confusion, *we shall throughout this discussion use the term 'skewness' in the sense in which it appears to be used by Finkelstein,* viz., *the displacement of the mode to the one side or the other of the median.* Finkelstein's reversal of an accepted usage should, however, not be forgotten.

[3] Judd, C. H., *On the Comparisons of Grading Systems in High Schools and Colleges, School Rev.,* 18, 1910, p. 469. The reference in Finkelstein to vol. 19 is incorrect.

[4] Meyer, M., *Experience with the Grading System of the University of Missouri, Science,* N. S. 33, 1911, p. 666.

as to this elimination. Is the work done in high school really so much like that done in college that there is a large previous elimination of poor college students?" There is an omission indicated by Finkelstein in his quotation. The passage from Meyer reads: "College teachers usually assert that the curve of distribution is not the normal curve, but a skewed curve like that of the continuous lines." The 'continuous lines' refer to a figure showing a curve skewed to the right. Finkelstein quotes Meyer to show that the curve is not skewed to the left; Meyer is actually maintaining that the skew is not to the right. Perhaps the end is the same in either case, *viz.*, that the curve is normal; but the error shows within what confusion we are working when the same sort of elimination can be held to skew the curve either the one way or the other.[5] How, in such circumstances, can we expect to come to a reliable conclusion? And, in fact, Meyer does not pretend to do this (although Finkelstein does not cite the relevant passage); for he writes, on the same page, "I do not admit, then, that anybody has proved thus far that the distribution of scholarly accomplishments in college is like the normal curve or like a skewed curve either way."

Finkelstein, however, seeks to go farther (p. 13) than the bare statements of Judd and Meyer that selection is not severe at the time of entrance into college. He quotes Huey[6] to show that "retardations occur continuously on up the years of growth to maturity," and suggests that "the remnant" that "arrives at college," after "its arrested members have dropped out by elimination," is still represented by the normal curve, because "the poorest of the surviving members represent a minimal ability just sufficient to cross the dead line of university entrance." The poorest drop out; but the distribution among college students remains unaltered, because others are retarded to take the places of those eliminated. So is nature become the handmaid of the academic statistician! It is not made clear why she is not equally concerned by the

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[5] Some recent figures published by D. Starch (*Reliability and Distribution of Grades, Science,* N. S. 38, 1913, p. 635) seem to indicate that a continuous progressive elimination to a point beyond the median might result in a curve skewed to the right. W. T. Foster (*Scientific Distribution of Grades at Reed College, Science,* N. S. 35, 1912, p. 887) assumes a displacement to the left,—the form that Finkelstein appears to attribute erroneously to Meyer.

The actual significance of Starch's curves does not concern us here, because we are arguing on purely theoretical grounds, whereas his curves are based on actual findings.

[6] Huey, E. B., *Retardation and Mental Examination of Retarded Children, Jour. Psycho-Asthenics,* 15, 1910, p. 41 (not page 43, as Finkelstein states).

embarrassment of the general biometrician at the discovery that the distribution of a general sample of the adult population must now, on the basis of the same argument, be skewed to the left,—for the general sample must include the normally distributed sample at college *plus* a large mass of the previously eliminated. Finkelstein himself, in speaking of "native ability," says that "in any population its distribution is that known as the curve of error, the probability curve, or Gauss's curve" (p. 11). In this connection we do not need to differ from Huey. Throughout his paper, Huey places in opposition the ideas of growth and retardation. Both are continuous. The mean of mental ability advances with age, but retardations continually occur to a greater or less extent; they affect, more or less, the whole sample of population, and thus they increase in range while the mean advances. There is no reason, however, to assume that the curve for the whole sample is anything but the normal surface. Huey might just as well have spoken only of retardation, in which case the genius would have been described merely as the least retarded; or he might have considered only growth. The point is, in the first place, that Huey says nothing to indicate that a sample of the total population is not distributed normally; and, in the second place, that, if it is so distributed, then the separation from it of a large selected portion—such a selection as Finkelstein freely admits—would be very unlikely indeed to leave a symmetrical curve.[7]

[7] For the sake of accuracy it should be noted that, according as selection tends to lop off the one end of the curve only, or to affect the whole group (in an increasing absolute amount) to a point somewhere beyond the median, the curve will be skewed to the left or right respectively. The first condition is what one would naturally expect, but it is conceivable that the lower two-thirds of the population, for example, should contribute, in proportion to their numbers, more or less to the general elimination. If both conditions are possible, then the intermediate case of the symmetrical curve is also possible. It is, however, improbable; and, in any case, Finkelstein should have shown all the possibilities, rather than have left the reader with the impression that the evidence preponderates in favor of the normal form of distribution.

A word here may not be amiss concerning the conclusions of other writers with respect to the curve. College teachers, according to Meyer (*loc. cit.*) are inclined to accept a curve skewed to the right. Foster (*loc. cit.*) bases the Reed College system on one skewed to the left. J. McK. Cattell (*Examinations, Grades, and Credits, Pop. Sci. Mo.*, 66, 1905, p. 372) selects the normal surface as a sort of compromise between displacement to the left, which he thinks is what might be expected, and displacement to the right, which is what he actually finds. Cattell says that the latter form is due to the tendency of the teacher to mark up (p. 375), but does not say why he is unwilling to explain in this way the whole difference between the theoretical and the actual forms. Meyer (*loc. cit.*), lack-

(2) Finkelstein's second point is that "marks should indicate, not ability, but accomplishment" (p. 14). He continues; "Is accomplishment distributed like ability? We have argued that accomplishment is the result of ability, *plus* previous preparation and zeal. When like zeal or effort is exhibited by two pupils, the one dull and the other brilliant, it seems probable that the gifted pupil reaps a *proportionately* larger result. It is as if effort were multiplied into ability rather than added to it. It is difficult to prove this assertion, but if it be admitted, the conclusion is evident that, if all the students put forth the same amount of effort, the curve of accomplishment would be skewed to the right." This is the argument in full. There has been no attempt to increase its obscurity by condensing it in transcription. Apparently what Finkelstein means is this: Ability is distributed normally. Zeal is assumed tentatively to be equal for all. It is effective for accomplishment in proportion to the amount of ability. Thus the normally distributed 'ability' is multiplied by the constant 'zeal' to give the curve of accomplishment. The result is, of course, not a skewed curve, but another normal curve. The form of a curve is never altered by multiplication by a constant.[8]

(3) In the third place, Finkelstein maintains that "when a marking system is arranged to measure accomplishment,

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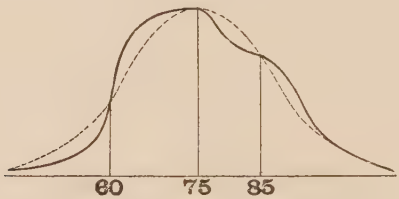
ing evidence, takes the normal surface as the most probable form. So also does W. F. Dearborn (*School and University Grades, Bull. Univ. Wisconsin,* 1910, No. 368). A. G. Smith (*A Rational College Marking System, Jour. Educ. Psych., 2,* 1911, p. 388) adopts the normal surface, because, "although only a small proportion of high-school graduates take a college course, it is fair to assume that the majority of such graduates have mental ability sufficient to take such a course, and a large percentage of the students who do not finish the high school would, if given a fair chance and encouragement, be capable of development and completing a college course." A majority,—but, like Finkelstein, Smith forgets the minority. And all these writers seem to expect the elimination to occur, like a sudden visitation of Providence, between graduation from high school and entrance into college. Why can not they learn from Huey that "retardations occur continuously on up the years of growth to maturity,"—in infancy, in the primary, in the grammar grades, in high school, in the college, in the graduate school? Surely the imbecile is eliminated from the college ranks, though every high-school graduate take his Ph.D.!

[8] Finkelstein's meaning may possibly be that accomplishment is dependent *both* directly upon ability *and also upon* effective zeal, which is, in turn, dependent upon ability. Thus accomplishment would be the sum or product of these two normally distributed factors. But since the one is ability, and the other is directly dependent upon ability, the curves could not be displaced relatively to each other and the resulting surface could not be asymmetrical.

another factor undoubtedly enters to skew the curve further to the right. This factor is the incentive offered to certain groups of students by the critical points of the system. Thus, at Cornell University, where a mark of 60 or above is necessary to pass, there evidently exists a type of student of inferior or average ability who aims for this mark. The possibility of exemption from final examination by obtaining a mark of 85 in preliminary examinations offers also a powerful incentive to students of average ability to push their accomplishment to the extent of their ability. Again, an average student, by persistent effort, may hope to obtain amark of 80 or over, and thus be eligible for consideration for Phi Beta Kappa and other special honors. On the other hand, the brilliant student, who probably profits most by effort, cannot attain a mark above 100, and it is not difficult for him to obtain a mark of 85 or over. The net result, then, of the imposition of a marking system is to crowd the grades of accomplishment forward to the right, and thus, again, to tend to form a skewed, and not a bell-shaped curve" (pp. 15f.).



Hypothetical curve of distribution of marks on percentile scale. Median and mode at 75%; hence (in Finkelstein's terms) the curve is not skewed. Departure from normal surface (dotted lines) is explained by additional 'zeal,' which may raise values normally below 60 to amounts between 60 and 75, and values normally between 75 and 85 to amounts above 85.

It is true that the effect of additional zeal or effort on the part of special groups would result in a curve that is not bell-shaped; but it is not necessarily true that the curve would be skewed in the sense that the areas on either side of the mode are unequal, that is to say, that the mode and the median do not coincide. In the figure is shown a curve in which a number of individuals, falling below 60 in the normal distribution, have been displaced to a position above 60, and in which the

same sort of alteration has been made at 85. The curve is irregular, but it is not skewed.[9] If it were the case that the additional effort of the students, who would naturally fall below 60, brought them above 75, or if the struggle to pass 85 extended in any large measure to those who would otherwise receive less than 75, a skew might occur. In such a case, however, the increase of effort would extend to a very much larger number of students, and would be effective to a very much greater extent, than Finkelstein seems to imply.

(4) Finally, the advocate of this system of marking would have us believe in the displacement of the ideal surface to the right, because "the actual distribution of over 20,000 marks in Cornell University is a curve skewed to the right" (p. 16). So, then, we are to reform our distribution by reference to the distribution itself. Could anything be less promising to a seeker after a 'scientific method of grading'? It is true that Finkelstein regards his curve as reliable because it is the "*consensus gentium*" of the faculty. But to this we may reply, in the first place, that if the *consensus gentium* be the just standard, then the individual student, whose final fate in college depends upon the average of a large number of marks, is not so badly off as we had supposed; and, in the second place, that a reformer has done but half his duty when he has corrected the unjust deviations from the mean without inquiring into the deviation from justice of the mean itself. If it is at all demonstrable that special factors might be operative to skew the actual curve to the right, then this curve can not be considered as a basis for the ideal distribution. And it is not difficult to suggest influences that might be operative.

(a) The curves of both Cattell[10] and Finkelstein are skewed to the right; that presented by Starch[11] shows a far lesser skew; and, in fact, Starch assumes that it is symmetrical.[12] Dearborn[13] finds the distribution practically normal. Since the curves do not agree, there must be some special factor operative, knowledge of which would explain the difference.

(b) A factor that is apparently effective in skewing Fink-

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[9] It is only in Finkelstein's use of the term that we can say that the curve is not skewed. By Thorndike's definition it is skewed, but it is skewed in a manner that in appearance somewhat resembles Finkelstein's skew, not to the right, but *to the left!*

[10] *Op. cit.*, p. 374.

[11] *Loc. cit.*

[12] Critics, however, on the basis of the figure shown, might object to the statement that "the distribution of the marks of college freshmen . . . in fact does conform to the probability curve." (p. 364.)

[13] *Loc. cit.*

elstein's curve to the right is inherent in the method of assigning final marks at Cornell University. Students having a grade of 85 at the end of the term may be exempt from the final examination. Those who take this examination have their grades raised or lowered, as the case may be, by its result. It thus happens that, while students below 85 at the end of the term have a chance to be raised above 85, the students above 85 have no chance of being lowered, because their work is already completed. Thus it happens that there is a weighting of the curve in favor of the student. In some courses, where the final examination is made easy, the effect would be considerable; and in those courses in which the grading by final examination is substituted for grading by term work, the differences would be very great indeed.[14]

(c) Finally, it may be suggested tentatively that, among other factors operating to skew the curve to the right, there is the fact that instructors do not regard all units on the marking scale as equivalent. It seems probable that a unit at the upper end is considered as more significant than a unit at the lower end. We hesitate more between giving 80 and giving 85 than we do between 20 and 25. Most instructors think nothing of giving a mark of 20% to an answer, which they would have marked zero had they continued to deduct for errors and omissions at the rate at which the first 10% was deducted. If, for example, Finkelstein's curve were replatted with an irregular scale of abscissae, so proportioned that from 85 downwards equal units of abscissa represent uniformly increasing numbers of percentile grades, the curve might very well be symmetrical. It is approximately symmetrical, if, as equivalent groups, there are selected the grades 0-44, 45-53, 54-61, 62-68, 69-74, 75-79, 80-84, 85-89, 90-94, 95-100.

It appears, then, that special factors may be present which determine the actual curves; and that, therefore, it is scarcely legitimate to utilize these actual curves as a basis for the determination of the ideal curve.

In general, Finkelstein's conclusion that "the pattern or theoretically ideal curve of high-school and college marks is, therefore, not the probability curve, but the skewed curve with the mode to the right of the middle of the abscissa"

[14] Finkelstein speaks throughout as if the number of marks of 85 or above actually represent (at least in the College of Arts and Sciences) the number of exemptions that were or would have been given; and he speaks as if the percentage found at 85 or above in the general curve represented the percentage that should receive exemption in practice. Such a procedure, on his own assumption that the average curve is the ideal one, would, for the reasons shown, be incorrect.

(p. 16) cannot be justified. Just what harm his assumption might work can not be definitely stated. We can say only of *The Marking System in Theory and Practice* that much more seems to be known of practice than of theory; and that, if reforms are to depend upon both—as, indeed, it would seem that they must—a more careful induction is needed than has hitherto been presented.

MEETING OF THE NEW ENGLAND COLLEGE LIBRARIANS

At a meeting of the New England College Librarians at the Library of Clark University, April 25th, Dr. H. L. Koopman, Librarian of Brown University, in opening the discussion on "The Position of the Library in the College" said:

"My remarks apply not to the university library but to the college library, and to the library of a college remote from any large reference collection.

"Only a generation ago the college library played a very small part in the life of the undergraduate; now it is generally admitted to be the most important single element in his academic training, and to be indispensable to the operation of all the rest. Books are bought for his reference use, for his collateral reading in connection with class work, for his preparation in debate, for his private reading to the end of culture or even entertainment; and to these are added a liberal supply of periodicals. There is therefore little danger that his interests will be overlooked in making up the library's annual budget. But how about the service of the library to the professor?

"Take the case of the young professor, coming to the college fresh from research work in connection with great libraries, and confronted with the problem of finding a living level between his high enthusiasms and his low salary. He has never before known or guessed what it means to lack the very breath of his scholarly life, and he feels like a mouse in an exhausted receiver. He has a few books of his own, but they are growing out of date with every passing month. Obviously, on his salary, with the family obligations that ought to be his, he cannot afford to buy a tenth of the books and journals necessary, not for research, but to keep him abreast of the times in his specialty and to nourish the enthusiasms that he brought with him. How is he met at the college library? Are his enthusiasms hailed as a college asset, or are his requests frowned upon as an attempt at a kind of private intellectual graft? There must be many college professors who can testify to a cordial appreciation and support of their personal studies as sources of academic power; but we fear that a much larger number would report a painful lack of any such recognition. No one can have a

wide acquaintance with American colleges and not recall many instances of atrophied professors, men who live in the past tense. They once knew, and then blessedly forgot, that they have ceased to be in vital connection with their subjects; but their students know it. They may still impart knowledge, but they cannot impart intellectual life, for that they no longer possess. The loss is theirs, of course, even if they are unconscious of it; but it is no less the college's loss. What avails our boasted equipment, if that element of its product which gives the chief value to all the rest shall be found wanting when the product is delivered to the consumer?

"It is not enough to say that the professor should avoid colleges where he will be condemned to intellectual dry-rot; he may sometimes be able to choose, but oftener he will not be able. It is for the colleges themselves to recognize their duty to their public, and to provide every professor with the means to preserve and increase his intellectual life. If it is pleaded that an attempt to provide equally for the library needs of professors as well as students would mean only to starve both, we must remind the objector that American colleges have now passed the pioneer stage when all things were forgiven to newness. A right of way is no longer enough to constitute a road; modern travelers demand macadam. If a college cannot back up the professions of its catalogue, cannot keep faith with its students,—for it all comes to this,—it had better close its doors. The world is filled with appeals to college loyalty—mostly financial; let those who respond see to it that in applying their contributions the intellectual life of the professor is not overlooked. His return will be in the form of that life transmitted, even if it is no longer also that of Chaucer's scholar, who

> 'busily gan for the soules preye
> Of hem that gaf him wherwith to scoleye.'"

Dr. Louis N. Wilson, Librarian, Clark University, following Dr. Koopman, said:

"I agree absolutely with all Dr. Koopman says, but how is a better state of affairs to be brought about? Is the difficulty due to lack of means, or is it due to a failure to recognize the true value of the library to the college? Is it not due more often to faculty administration than to lack of funds?

"The great majority of our college libraries are administered by a committee of the faculty and if the young professor or instructor has not been properly fed by the library does not the fault lie with his faculty colleagues? My own impression is that while the professors of a college are deeply

interested in a good library, and cannot well conduct their courses properly without it, they have not shown any marked ability in guiding it in the past. I sometimes think that the library should be divorced absolutely from faculty control and should be as independent as any other department of the college. The librarian should be directly responsible to the president, and while he will, if he is qualified for the position he holds, consult freely with his colleagues, he will accomplish far more for the college as a whole if freed from faculty control.

"In apportioning funds we know how insistent heads of departments are concerning the needs of their departments. Do they ever insist upon the needs of the library if by doing so their laboratory or teaching appropriation is likely to be affected? Are they not too vitally interested in securing departmental appropriations to be the best advisors for the library? I may be entirely mistaken about these things, but I would very much like to know."

The above was submitted to several professors and librarians for comment and brought forth the following responses. —[Ed.]

Dr. Koopman's remarks are limited to an appeal for attention in the College Library to the needs of the faculty in individual research. No one would dissent from them. The question would be one of means. The material required by the individual professor for "research" proper, would be apt to be material of the unusual sort; that is to say, material beyond that which would be necessary to the collection as a "good working library" for a *College*. With ample resources, it may be procurable, but if the alternative be to procure it through the omission of the books which are fundamental to the good work in a Library or a College, it must inevitably be foregone.

The device then available is: to borrow it for his use from some University, State or Municipal library, or the Library of Congress, as opportunity may offer.

Sympathizing with the spirit of Dr. Koopman's appeal, Dr. Wilson apprehends in an effort to meet it, a tendency to delegate the control of selection to the faculty itself. Such a course, with an actual partition of the purchasing funds among the several departments, is quite usual in academic libraries. Never having administered in an academic library, I have no personal experience of the effects. I am not ready to believe that they are more favorable to any one individual member of a faculty, than if the selection were left to the librarian untrammeled; and it is quite clear, in the nature of things, that removal of the authority from him will be *apt* to endanger the organic integrity of the collection as a working library, by the application of the funds, or a large fraction of them, to the purchase of material of an interest but transitory, special and limited to the momentary caprice of a specialist, preparing, perhaps, a critical commentary, or otherwise merely "particularizing."

This apprehension indeed seems in terms to concern, not merely the selection of books, but the administrative control of the library; from the tendency to vest this in the faculty, I heartily dissent. That there

should be a committee of the faculty "on the library" is obvious, but the relation of that committee should be purely advisory, with, of course, the authority when specially conferred, to consider and report upon a suitable policy for the library, and, when called upon, to report upon its conduct. As far as administrative control is concerned, however, there should be no intervening between the President of the institution and the Librarian.

HERBERT PUTNAM,
Librarian of Congress.

Until less administrative and class room work is required of college professors and salaries of both college professors and librarians are larger, we are not, it seems to me, warranted in asking for appropriations for the purchase of books for specialists. The diligent specialist will in any case make use of the larger libraries during vacations and sabbatical years, and the book post now makes books in these libraries fairly available at all times.

I feel as Dr. Wilson does that more authority should be given to the president of the college, and more to the college librarian. In other words, the same autonomy should be given to the library which is given to other departments of the college. At the same time, it is desirable that there should be a larger measure of publicity regarding library expenditures.

W. D. JOHNSTON,
Recently Librarian Columbia University.

If I understand aright the point at issue and the matter on which you desire a brief comment, the following statements represent my views.

(1) College students should be required to purchase for themselves more of the books assigned them for required and collateral reading than is now the custom. I think that if the necessities of the courses taken call for it, a student might fairly be asked to spend fifty to seventy-five dollars a year on books. I have known of students who worked in a factory during vacation in order to make a contribution to the funds necessary for the college baseball and football teams. If such sacrifices are made for athletics, I think they might also be made for literary material. Such a practice would annually release many hundreds of dollars of library funds now expended for duplicate copies and material not particularly useful for purposes of investigation.

(2) Administratively the library should be considered an independent part of the college, or at least just as independent as a fully organized department of instruction, e. g., history, romance languages, etc. The librarian should have the rank of a full professor, be entitled to a seat and vote in the faculty, and be directly responsible to the president. If there is an advisory council on the library he should, of course, also be a voting member of that body. Whatever may be the manner of administrating the affairs of the library and apportioning its funds, there should always be proper faculty representation, but rarely, if ever, unrestricted faculty *control.*

(3) One of the greatest difficulties confronting college and university library administration at the present time is the lack of men able to take a broad and well coördinated view of the library situation as a whole. As a result of buying to meet the needs of specialists, our collegiate collections are as spotted in character as a leopard's skin. They are usually conspicuously lacking in the fundamental ma-

terials for the study of a particular field of knowledge, material which should first be acquired before any attempt at gathering intensively the literature of a particular division of that field.

(4) Bearing in mind the financial limtiations characteristic of nearly all small colleges, I cannot see much hope of their being able to acquire the materials for advanced investigation and research. Their only chance of acquiring such material is the receipt as a gift of some great scholar's collection or a large special fund the income of which may be used exclusively for the purchase of books on a given subject. To build up a collection of books and manuscripts suitable for original investigation in a wide range of subjects would require an annual expenditure of at least $25,000 for books alone for a very considerable series of years.

W. N. C. Carlton,
Librarian Newberry Library.

Dr. Koopman's remarks on "The Position of the Library in the College" at the recent meeting of the New England College Librarians are quite worth serious consideration. I am in hearty accord with the views expressed, and I do not hesitate to add that the President and Trustees of Smith College encourage and liberally support a library administration which keeps in mind the needs of the professors as well as of the students. Especially on the appointment of new professors they are asked to suggest books and periodicals which may not be in the library, yet needed in connection with their work, both personal and with classes. Every year several special appropriations are granted for the purpose of bringing up to date material thus requested. It is the fault of the individual professor if he "lacks and suffers hunger," and not of the administration, in so far as encouragement and provision for satisfying his needs are concerned. There is no "dry rot" among the professors, to my knowledge, and there is no library committee of the faculty, the library being "as independent as any other department of the college." Whether there is any significant conclusion to be drawn from these facts, I cannot say.

Josephine A. Clark,
Librarian Smith College.

It is, I suppose, out of the question for any College, however well endowed and however wisely administered, to provide a research library for all of its professors and departments. The Universities themselves make no such lavish provision; any extensive bit of research, wherever undertaken, means that books must be borrowed from various sources.

But our professor is not helpless. (1) He should keep in touch with the head of the University department which he has just left. He should take with him, to his new quarters, a programme of research, made out with direct reference to the materials available in the College to which he has been called; and when a new problem presents itself he should lay it before his University professors and get their advice. They are not infallible, but they have a perspective. (2) Private libraries are worth more than Dr. Koopman thinks. Every graduate student should subscribe for two technical journals, one of them foreign, and should spend a stated percentage of his income in the purchase, from second hand catalogues, of the classics of his science. If he follows this plan, and avoids buying current text-books, he will carry away from the University the nucleus of a working library; classics and standard periodicals do not fall out of

date with every passing month. Unfortunately, the American student is not by nature a book-buyer: but he may be advised. (3) The University libraries will lend books to the Colleges. The present plan of borrowing and lending is cumbrous and wastes time, and individual librarians have their prickly sides; but in principle the loan of books is provided for. Let the College library, now, take upon itself the expenses of correspondence and carriage; let it regard this sort of expenditure as a necessary and profitable thing; let it assign a fair amount to every department for the procuring and return of books needed in research. It will have bought fewer books, at the end of the year, but it will have kept its professors alive. I do not know anything of the control of College libraries; but this requirement implies, plainly, that the library funds be impartially administered for the benefit equally of all departments; it implies also that the annual income of the library be stable and not subject to violent fluctuation. On these points I agree with Dr. Wilson. (4) It should not be forgotten that annual bibliographies give the student of today advantages undreamed of twenty years ago. The College library may and should possess these bibliographies; for access to them enables the professor to get his bearings in a way that supplements, very usefully, the recourse mentioned under (1).

Professor E. B. Titchener,
Cornell University.

I am, of course, a rank outsider in matters of library economy and organization; but an experience of many years in various American and other universities has given rise to certain convictions regarding this question. The more I see of the practical working of various plans of organization and administration, in universities and elsewhere, the more am I convinced that the policy which proves most satisfactory to all concerned consists in first choosing a competent individual, then enclothing him with as much power as possible and restricting him just as little as possible in his mode of procedure, and finally in holding him responsible for "delivering the goods." This general plan of operation not only promotes harmony, but it makes the officer feel that the success or failure of the discharge of the duties of his office rests with himself alone. Applied to library administration, this means simply that a competent librarian is better qualified than any member of the university faculty to administer the affairs of the library; only where the librarian is incompetent should a portion of his powers be delegated to a library committee,—but even in that case a much more successful solution of the problem would consist in securing the services of a librarian who is competent. The Clark Library is more successfully administered than any other library that I have ever had occasion to make use of either in America or in Europe; and I for one would very much regret any step that would curtail in any particular the supreme power of the librarian in matters concerning the administration of his library.

Professor J. W. Baird,
Clark University.

REFORM IN EDUCATION

By Robert Bennett Bean

Some reflections as to the present status of education in America, reflections that have come as a result of extended studies in the eruption of the permanent teeth, have prompted me to suggest a scheme for saving time in education without loss of essential values otherwise. There is a waste of at least two years in the present plan of American education. This is the conclusion reached by a committee of prominent educators in a report on "Economy of Time of Education" just issued by the United States Bureau of Education, and I believe a greater waste than this is present.

The conclusion follows an investigation lasting nearly 10 years by a Committee of the National Education Association,[1] of which President James H. Baker, of the University of Colorado, is chairman. The committee have endeavored to form a plan that would do away with the two year loss. They propose that 6 years be assigned to the elementary school instead of 8 as at present; that the high school period be from 12 to 18, divided into two parts, of four and two years each; that college work extend from 18 to 20, or 16 to 20, according to the method of distributing the last two secondary years; and that graduate or professional work at a university cover the years from 20 to 24. This would enable boys and girls to get ample vocational training after the age of 12; it would enable those who go on to college to get through their college work at 20; and it would save the professional man from having to wait until 27 to start his professional career.

The report insists that the present elementary course is too long; that the ground now covered in 8 years can be covered just as efficiently in 6, allowing secondary work to begin at the age of 12. To save on elementary schooling they urge: "Choose the most important subjects and the most important topics; make a distinction between first-rate facts and principles and tenth-rate. Confine the period of elementary education to mastering the tools of education. Include the last two years of the present elementary school in the period of secondary education and begin the study of foreign language, elementary algebra, constructive geometry, elementary science, and history two years earlier than at present."

Emphasis is laid on the necessity of concentrating on a few valuable studies: "The great mistake of our education is to suppose that quantity and strain constitute education. Education is a question of doing a few essential things well and without over-strain. The college has committed a grievous mistake in demanding ever more in quantity rather than in quality produced under conditions of healthy normal development."

The report takes up the problem of saving time in education from the point of view of the college, the school, and society at large,

[1] *Economy of Time in Education.* Bulletin U. S. Bureau of Educ., 1913.

as well as of the individual pupil; and it contains opinions on every phase of the question from representative school men and the general public.

It has seemed to me that the professional man should start before the age of 24, because several years after graduation from a university should be devoted to experience in the profession before the actual work of life has begun, as is now being done in the medical profession by internes in hospitals. There is no more reason why inexperienced engineers, lawyers, or others should be foisted upon an innocent public than physicians. It is true that we should cut out the non-essentials in the primary schools, and lop off the excrescences, and there is much to be said in favor of repairing the foundation before the superstructure, but in a plastic system it may be well to begin in the middle and work both ways. A fitting capstone for a school system may become a suitable foundation for more advanced education. Compression may well be started with the university and the secondary schools, by allowing the first two years of the former to count also as the last two years of the latter and thus securing the Bachelor's and Doctor's degrees both in six years.

Education is the full rounding of the individual mentally, physically and morally, and should be approached from the biological standpoint as well as from any other. At the age of 16 years practically all the structures and functions have attained their competency, and at this time four vistas open before the youth on the threshold of life. The muscular, mental, sexual and alimentary activities are ready for ripening: exercise, study, the passions and the appetites are in full play. They may be grouped in two categories, motor and sensory. The muscular and mental activities are motor, the sexual and alimentary activities are sensory. The motor activities control the sensory, but if the sensory activities are ripened at the expense of the motor, the body may control the mind. It is essential that the motor activities become dominant, and that they may become so they must not only be exercised well, but as expressed by Henry James stresses and strains that reach the physiological limit of endurance will not only keep one occupied but will enable one to do more thereafter. The youth should be driven hard from 16 to 20 years of age because at that age the appetites and passions are strongest in youth, and this is the time when the mind and body are capable of responding to stresses and strains, therefore it is expedient at this time to give the mind the greatest amount of work it can endure, and to keep the body fit to nourish the brain, that by so doing the passions and appetites may be subordinated.

The crucial period of the 6 years course that I advocate for the completion of secondary and advanced education is the first two years, and this should come at about the age of 16 to 18 years. At the end of this time the student should have completed Mathematics through calculus; Latin, Greek and English; German, French and Spanish; Physics, Chemistry and Biology; and Civil Government. The courses should be complete, such as for instance in Chemistry through quantitative and qualitative analysis, organic and inorganic; and in Biology to include the dissection of a mammal, and the microscopic study of plant and animal tissues.

This should fit a person for anything whatsoever in life, and if advanced study is undertaken the next two years should be devoted to the fundamentals of the specialty selected, and the two years after that to the practical applications of the subject in the nature of original investigations.

The first two years work should entitle the participant to a cer-

tificate or degree of the fundamentals; the second two years to the Bachelor's degree; and the third two years to the Doctor's degree, which should be specific, as Doctor of Medicine, Doctor of Law, Doctor of English, Doctor of Engineering, Doctor of Agriculture, or what not. The first two years should be given in all the high schools, colleges, or other secondary schools, and well equipped teachers and laboratories should be provided for the courses of this period. All primary education should be raised to conform to this standard, and all advanced education would be raised following it. In this way the age of 18 would be the starting point for the young entering a business or other enterprise, the age of 20 would be the starting point for those who could not complete a professional education, and the age of 22 would be the starting point for the professions.

In consideration of the fact that at least four classes of students exist, a few exceptionally gifted, a few exceptionally poor, a large class of rapid workers and a large class of slow workers; or those who are unusually precocious, or unusually backward, and those who are only slightly precocious or slightly backward; in consideration of this, there should be at least four provisions made to meet the needs of all.

The selection of teachers is the most important task of the educator, and until the pay of teachers exceeds that of bricklayers, carpenters and plumbers, the best intellects will not be attracted to teaching except as a means of self-denial. The teachers in the primary schools should have the gifts of keen insight into human nature; the instincts of the born commander, and the power of imparting to others the essentials, whereas the teachers in advanced courses should have not only the powers of analysis and synthesis in productive thought, and the quality of exact observation with correct inference, but also the power of transmitting to others both inspiration and enthusiasm.

AN EXPERIMENT IN TEACHING SPELLING

By Martha J. Fulton
Paterson, N. J.

Aside from the teaching of Reading, perhaps, no other study in the curriculum of school education leads to more discussion than the subject of Spelling.

Many tests of spelling ability of school children have been made in the past few years with results varying as widely as the prejudices of the experimenters; in one instance the test seems to show absolutely no benefit from the years of spelling-book "grind;" in another the spelling drill shows appreciable results. The chief difficulty lies in the interpretation of the results, a difficulty which would disappear if the tests were of methods rather than mere results. Experiments in spelling, such as were made in the Horace Mann School of Columbia University, in which the conditions were carefully controlled so that there need be no ambiguity in the interpretation of the results, are needed to guide the class teachers in the selection of a method or methods.

No method should be established in a classroom without a preliminary, carefully-controlled experiment to determine what is best adapted to the children individually.

A professor in one of the leading universities of New York City has declared that a child learns to spell when simply assigned a lesson and told to study the words, leaving the method used entirely with the child itself. This might prove satisfactory in a few instances where the children are naturally good spellers. There are many, however, who lack this ability to picture the word, and for these some form of drill seems necessary.

To determine the exact benefit, if any, arising from persistent drill in spelling words the following experiment was made with a 4-B Grade in a public school where the children in attendance are of average ability.

One hundred words were taught in two weeks (ten school days), ten each day, using this procedure:

I. Write word upon the board.

This presents to the child an opportunity to visualize the given word, or, expressed differently, to enable the child to form a visual image of the word before him. The basis for this lies in the fact that a large per cent of children learn best by the process of "seeing."

II. Explain meaning of the word.

Many words are entirely lost to the child for want of a thorough understanding. When the meaning of a word is clear in the mind of a child, the successive appearances of that word make a far greater impression than if it is unknown. This is aided by the next step:

III. Children use the word in a sentence.

Knowledge becomes useful when one possesses the ability to apply it. A child takes a greater amount of interest in words that he

can use freely, taking his own vocabulary as a means to support the new word.

IV. The children write word ten times and while writing say each letter aloud.

Most individuals can learn more readily and retain longer the words gained by writing and talking at the same time. The letters are made to implant a mental word picture in the minds of the children, through the ears for those with "audile" memories, and from the lips and fingers for those with "motile" memories.

V. Emphasize by intonation of voice or by colored chalk on blackboard the difficult parts of the word.

A thing is better remembered when it reaches the mind with greater intensity than ordinarily. If the "hard" part of the word, for instance, the "yg" in "hygiene," stands out prominently and is memorized thereby the other parts tend to go along with it.

At the end of the ten days drill a test in the one hundred words was given with the result as shown in column I, table I.

TABLE I

Number of pupil	I Spelling with drill	II Three weeks later	III Spelling without drill	IV Three weeks later
1	100	100	78	64
2	100	98	74	68
3	100	100	94	94
4	100	100	86	84
5	100	98	86	80
6	100	100	54	40
7	100	100	72	60
8	100	100	86	80
9	100	98	90	92
10	100	98	72	68
11	100	98	80	80
12	100	98	84	86
13	98	100	82	74
14	98	98	78	70
15	100	100	88	72
16	94	100	74	70
17	98	96	72	72
18	98	94	92	92
19	98	90	64	60
20	98	92	46	40
21	98	90	70	68
22	98	88	44	40
23	96	100	70	66
24	96	94	58	50
25	96	96	64	60
26	94	88	68	68
27	94	96	58	50
28	90	90	54	50
Average	98	96	73	68
Average deviation	1.9	3.4	11.2	11.8

Following this a group of one hundred words of similar difficulty (all the words were taken from Hick's Champion Speller, pp. 40-41) was given the children during ten school days with no directions except to "study the lesson." The children were "heard" in their spelling each day and the next lesson assigned, but no effort was made to teach the spelling. A test of these words at the end of the ten days produced the results shown in Column III.

Three weeks after the test of the first group of words (no mention of them having been made in the meanwhile) another test was made to see what per cent of the words had been retained. The results are shown in column II. A test of the second group three weeks later produced the results shown in column IV.

Table II shows the number of children who fell below, remained stationary or increased their averages after the three weeks interval. The few cases of increase are due probably to the children having accidentally seen the words in reading or otherwise and thus become familiar with them. It will be seen that not only was there a 25% loss in spelling ability when the drill was stopped, but the ability to retain over a long period of time was affected in 25% of the children.

TABLE II

Summarized from columns I and II of Table I:			
With drill	Below in the second	14 or	50%
	Same in both	10 or	36%
	Above in the second	4 or	14%
		28	100%
Summarized from columns III and IV of Table I:			
Without drill	Below in the second	21 or	75%
	Same in both	5 or	17%
	Above in the second	2 or	8%
		28	100%

Daily Results, All Pupils

With drill	99%
Without drill	78%

Conclusions

The results of this experiment may be summarized in the following statements:

I. Spelling drill is necessary in any class where the children vary in ability.

II. The best results are obtained by presenting the words in as many ways as possible.
   1. Spelling orally.
   2. Visualization of words.
   3. The combination of writing and talking.
   4. The correlation of word with its meaning, to fix a permanent impression.

III. Constant drill.

IV. Awakening of interest.
   By presenting devices which will appeal to children of various stages of intellectuality.

V. Actual Supervision.
   Methods of study should be given to the children and continually supervised by teacher.

THE ANATOMY OF SCHOLARSHIP

By Gilbert Cosulich

There are some who regard the scholar merely as a sponge: an object that does not assimilate or contribute, but simply absorbs. They believe that learning involves neither culture nor research. "Scholarship," says one writer, "is pedestrian in its methods, and requires only industrious application for its achievement . . . culture is to be attained only in more difficult ways, and under more genial guidance." "A high degree of learning may exist quite apart from special investigation," observes another essayist.

The divine thirst for data is, of course, the best safeguard against false conclusions. The true scholar examines, compares, and tests his facts before he announces results; and even then he very frequently understates his case. Too much of our modern criticism, as the present writer has elsewhere endeavored to show,* is all conclusions and no data.

But although learning begins with facts, it does not end with them. There are, indeed, data-sponges whom the people choose to call scholars; but the legal maxim that common error makes law does not apply to abstract standards. The English scholar who has transcribed his marginalia on a hundred thousand slips would be nothing more than a cataloguer if this classified collection did not assist him in his constructive criticism.

The man of learning is more than a mere encyclopedia; he is ideally a seer, an interpreter, a creator. The commentator that by reference to Catullus explains to me a meaning in *In Memoriam* has done what no encyclopedia could do: he has been a mediator between a great intellect and mine.

The phrases "unproductive scholarship" and "dry-as-dust learning" are both contradictions in terms. Scholarship must produce; and, however indirect be its processes, it must have some vital objective. James Watt was a scholar because he alone interpreted facts that were probably known to almost any engineering undergraduate at Glasgow. Stedman deals with parallel passages not as an end but as a means. Erudition is not dead, but living: a beacon, not a cobweb.

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* "Of Generalities in Criticism," *The English Journal*, November, 1912.

NOTES

SOME REPORTS FROM BOHEMIA

New Accounts of the Life of J. A. Comenius. The Bohemian pedagogical review, *Pedagogické Rozhledy,* publishes in numbers 7 and 8 (of this year) new accounts of the life of John Amos Comenius, the great Bohemian educator in the seventeenth century. The accounts are according to recollections of J. A. Comenius himself, from his work, "Continuatio Admonitionis fraternae de temperando charitatis zelo." Many sheets of this till now unknown work of the great educator were discovered by the Bohemian University professor, Kvacala, in the Public Library in St. Petersburg. The recollections begin at the departure of J. A. Comenius from his fatherland and they end at the year 1658. In these sheets also the voyage of Comenius to London in the year 1641 is described. The Bohemian educator was invited to London by the Parliament itself, after a speech of Dr. Gaudentius, who recommended the pedagogical efforts of Comenius. Comenius was received by Sir Samuel Hartlib and the Archbishop of York. He was offered the management of the college of Chelsea. But a rebellion in Ireland and the departure of the king interrupted all negotiation. Because Ludvig von Geer invited Comenius to Sweden, he was not hindered by his English friends (Archbishop of York, Earl Brook, Dr. Pym and others) from departing for that country.

The Pedagogical Literary Association of Bohemian Teachers, "Dědictvi Komenského" (Legacy of Comenius), celebrated this year the twentieth anniversary of its foundation. The association published in twenty years 45 special educational works for teachers, 10 volumes of the Library of Pedagogical Classics (Comenius, Locke, Rabelais, Rousseau, Tolstoi, G. S. Hall), edited by Fr. Drtina, Ph. D., Professor of Philosophy and Education in the Bohemian University of Prague, 17 volumes of the Encyclopedic Library, 5 volumes of the Child Study Library (edited by Fr. Čáda, Ph. D., Professor of Philosophy in the Bohemian University of Prague), 41 volumes on contemporaneous educational problems, 36 volumes of a School Children's Library, 3 musical volumes and some pictures. The organ of the Association is the greatest and best Bohemian pedagogical monthly, "Pedagogické Rozhledy." It has 14 departments: Pedagogy and History of Education, Educational Matters of the Elementary School, National Education, The Slav School World, Religious and Moral Education, Education for Arts, Child Study, Child Pathology, Children's Literature, Care Committees, Physical Education, School Hygiene, Review of Pedagogical Reviews. Each department has its own editor (three university professors—the chief editor, Fr. Drtina, Ph. D., Ot. Kádner, Ph. D., Fr. Čáda, Ph. D.,—two secondary school professors, an inspector, and many head teachers being the editors of individual departments). The review prints 112 pages each month and has 7,400 subscribers. The members of the Association pay only 10 crowns ($2), and they have the right to buy all books published by the Association at the price of production. The Association has now 3,482 members (3.044 teachers, 76 professors, 19 inspectors and 343 associations). In the last year it expended 74,340 crowns

($14,868), and had 77,645 crowns ($15,529) income. The net property of the Association is already 40,484 crowns ($8,097).

The Boy Scout Movement has now spread into Bohemia, chiefly among secondary school pupils in Prague and its suburbs, under the care of Professor A. P. Svojsik, who translated the English work of Sir R. Baden Powell. The volume has contributions also by thirty-one Bohemian men of science (five university professors), and contains 724 pages, with 208 illustrations. To the literature of the Bohemian Scouts Movement five other books have already been added: (1) Bohemian Boy-Scout, (2) Camping, (3) In Nature, and (4) The Art of Observing, all by Professor A. B. Svojsik, and (5) The Meaning of Scouting by Fr. Čáda, Ph. D., Professor of Philosophy in the Bohemian University of Prague. EM. LIPPERT.

SOUTH AFRICAN CHILD STUDY SOCIETY

On November 21st, 1913, the South African Child Study Society was established at the South African College in Cape Town. Its aim is declared to be two-fold: to bring teachers and others interested in childhood to sympathetic and intelligent study of child phenomena, and second, to carry out co-operative and careful investigations into some of the more pressing problems. The society was inaugurated in a large meeting presided over by the Mayor, which was addressed by the President, Mr. E. O. Vaughan, Professor Clark and others, the Mayor being Honorary President. The first publication of the society consists of a "composition inquiry," which after general instructions, proceeds to describe the method of attaining facts depending mainly on reproductive imagery. The children are to read a story told by the teacher, reproduce the substance of a lesson, describe an event, either an incident they have lately seen or heard of, and tell what they thought about it, to describe an incident that illustrates some trait, such as kindness, etc., and describe a scene. The second series of tests are facts depending on originative imagination, and the children are to write a story about a picture or complete a story, criticize one containing an absurdity, write an autobiography of some object or creature. The third theme consists of two expressive drawing tests, the first based on a story told by the teacher and reproduced by the pupils in picture, the second, an original story written and illustrated by pupils.

PICTURES OF PSYCHOLOGISTS

In accordance with the plan suggested in the PEDAGOGICAL SEMINARY some months ago, a collection of about thirty pictures of psychologists has been made by E. A. Kirkpatrick of the Fitchburg Normal School, Fitchburg, Mass.

BOOK REVIEWS

Stammering and Cognate Defects of Speech. By C. S. Bluemel. Two volumes. New York, G. E. Stechert & Co., 1913. pp. vii, 365, 391.

These volumes are the result of many years of systematic investigation of the field which they cover, carried on privately and in connection with research work at the University of Colorado.

The theoretical part of the work is contained in the first volume, entitled "The Psychology of Stammering." The focal point of the discussion, and the author's chief scientific contribution, is his theory of causality. As he states, "the theory has been developed in large part as the result of introspective evidence,—evidence as indispensable as it was uncoveted." (vi.) The introspective evidence has been supplemented by the results of a thorough study of practically all the available literature and with the returns from a questionnaire. The syllabus of the latter, together with the author's own answers to the questions, is given (pp. 238-248).

The devotion, even boldness, with which the author has given himself to his research is well illustrated by an experience of which he gives an account (pp. 130 sq.). "The writer was in the Rocky Mountains, crossing a pass at an elevation of 12,000 feet. A violent storm prevailed. There was a heavy rain, and a freezing wind against which it was difficult to stand. The writer attempted to communicate with another member of the party, and found to his astonishment that his language was completely unintelligible. It was, in fact, the meaningless jargon of aphasia. . . . As soon as the nature of the disturbance was recognized, the writer undertook an introspective analysis of the mental condition. . . . The aphasia disappeared soon after a more protected part of the mountains was reached . . . and as the thought-processes had not been thoroughly introspected, the writer returned—with more zeal than wisdom —to an unexposed position in the pass in order to restore the conditions for the analysis. The aphasia thereupon returned."

The author notes that in the past the phenomena which form his subject-matter have been studied almost exclusively in their physical manifestations. In the present work the subject is considered primarily in its mental aspects. As the book is designed not only as a contribution to scientific theory but also as a guide for those who are subject to the defects studied, most of whom would have no special knowledge of psychology, a brief survey is given of the fundamental principles of general psychology and the meaning of psychological terms. An extended glossary is also given at the end of the second volume, also a bibliography of some 350 titles.

Separate chapters are devoted to the following topics: Mental types (eye-mindedness, ear-mindedness, etc.), the verbal image, the brain, the relation between mental types and voluntary speech, impairment of the brain-centres (aphasia), stammering, mental confusion in stammering, fear and auto-suggestion.

The author examines the most commonly accepted theory of the cause of stammering, namely, that it is caused by delay of vocaliza-

tion, that is, inability to produce voice. He presents evidence to show that the difficulty is not one of the production of voice as such. His conclusion as to causation is, to quote his own words: "*The stammerer's difficulty is transient auditory amnesia;* he is unable to recall the sound-image of the vowel that he wishes to enunciate. This, then, is the thesis of the present monograph. The stammerer is an audito-moteur. He relies for his speech-cues upon both kinaesthetic and auditory images. When he stammers in enunciating a word, it is because there is complete failure of the auditory image. His futile struggles with the initial consonant are directed solely by his kinaesthetic imagery, but he cannot pass to the vowel because he cannot recall its sound, its peculiar or characteristic quality." (p. 187.) He finds that this explanation "is borne out by practically every manifestation of the defect and every phenomenon connected with it."

Other investigators have conceded that stammering is a form of aphasia, but the defect has usually been regarded as some "obscure and undiagnosable form of subcortical motor aphasia, or ephemia." (pp. 227 sq.) The author presents cogent arguments against this latter theory, and concludes, "The theory of the failure of the auditory image is the only one that satisfactorily explains all the phenomena involved."

In explanation of the relative weakness and vulnerability of the auditory faculties and their greater liability to derangement than, for instance, the motor faculties, the author presents the following considerations, which are of interest to students of genetic psychology. "Hearing is one of the distance-receptors, and is a more recent acquisition in the evolution of the human race. It is one of the later terms in evolution, and hence is one of the earlier terms in dissolution. The motor faculty is phylogenetically the oldest, for the converting of a sensory stimulus into a motor response is one of the primordial functions of protoplasm. The motor function of the nervous organism is therefore the least likely to be undermined. The auditory function, on the other hand, is relatively vulnerable; and it is liable to derangement by even a minor cerebral disturbance." (pp. 231-233.)

"That stammering is an auditory disturbance is borne out by the fact that it does not occur in persons not dependent upon auditory cues. Stammering seems to be entirely absent among the congenitally deaf that have been taught to speak." (p. 234.) "The desideratum in speech is either strong auditory imagery or no auditory imagery at all. The strong imagery renders one immune from speech-disturbances when slight variations in its intensity occur; the absence of the acoustic imagery renders variation impossible. It is the fugacious and vacillating, auditory imagery that causes the stammerer's trouble." (p. 255.)

We are reminded that "the fact that the stammerer is subject to temporary auditory amnesia under particular conditions does not in the least militate against his intelligence. So far as intelligence is concerned, stammerers are normal persons. They probably vary between the two extremes just as do persons of normal speech" (p. 277). Among the stammerers mentioned are Aristotle, Æsop, Demosthenes, Alcibiades, Virgil, Erasmus, Charles Lamb, Erasmus Darwin, Charles Darwin, Moses Mendelssohn, and Charles Kingsley. "With so many of the world's greatest geniuses among stammerers, one might almost regard stammering as an accomplishment" (p. 278).

While the primary cause of stammering is held to be transient auditory amnesia, the author recognizes a number of secondary, or

auxiliary, causes, including bewilderment, perversion of verbal imagery, auto-suggestion giving rise to inhibition of the will, and finally, fear. Of the last of these, we are told that it is "perhaps the most important of the mediate causes of stammering. The stammerer's fear is somewhat similar to stage-fright. It takes the form of an all-consuming dread that effectively deprives the speaker of muscular control. . . . It is not merely fear of incurring ridicule, or the fear of making oneself ridiculous; it is rather the fear of 'travailing with unborn thoughts.' It is one of the subjective aspects of stammering that only the stammerer himself can understand" (p. 291). These secondary causes are treated in detail, the conclusion being that they are themselves *effects* of the primary cause. If the latter could be removed, the secondary causes would vanish. Hence "the removal of the amnesia is of chief importance." (p. 334.) Suggestions are given for reducing the trouble as far as possible, but, according to the author, "if a complete and permanent cure is to be effected, the stammerer must cease to be dependent upon auditory images; for, so long as he relies upon these images as speech-cues, he must *inevitably* stammer when amnesia occurs. If it is possible, the stammerer must learn to depend upon kinaesthetic and visual cues" (p. 362).

The second volume contains a synoptical review, with criticisms, of the various systems of treating stammering in Europe and America. The systems cited "have not, as a rule, been given for their sovereign merit. Indeed, many of the systems are entirely devoid of merit; they have been recorded merely because they are gold bricks that are daily sold to stammerers by an infamous fraternity of 'speech specialists.' The wretched systems must inevitably become obsolete with the advancement of the psychological investigation of stammering. But meanwhile progress is hampered by charlatans, who rob the stammerer and bring everybody and everything connected with the treatment or investigation of stammering into disrepute. Manifestly it is incumbent upon stammerers themselves to remedy these conditions" (Preface, p. viii). The methods of treatment are grouped under the following heads: respiration, vocalization and vowel-production, articulation, verbal exercises, modes of enunciation, mechanical appliances; the last chapter, dealing with "stammering schools" and "speech specialists," is one of the most thoroughgoing and startling exposures of charlatanry in literature. The book should be in every school and public library, and should be read by all students of psychology, by parents and teachers, as well as by the many who would personally profit in a practical way by a knowledge of its teachings. As to its central theory of causality, it only need be said that it appears to the impartial reader to rest on a surer foundation of careful and comprehensive observation and critical analysis and interpretation of facts than any other theory in the field. The book cannot be too highly recommended.

A. N. GILBERTSON.

Psychologie der Sprachpädagogik: Versuche zu einer Darstellung der Principien des fremdsprachlichen Unterrichts auf Grund der psychologischen Natur der Sprache. Von CHR. B. FLAGSTAD. Leipzig u. Berlin, 1913, pp. xxviii., 370. Mit einigen Kurzungen und Änderungen vom Verfasser aus dem Dänischen übersetzt. Price, geh. M 5, geb. M 6.

This work is distinguished from others in the psychology of language in that it is devoted exclusively to the practical problems of

teaching contemporary foreign languages. On its psychological side it suggests Wundt, but more particularly Höffding. On its pedagogical side it reminds one now and then of Henry Sweet's "The Practical Study of Languages." Like Sweet the author belongs to the conservative camp. He formally and explicitly claims adherence to the Indirect Method of instruction and is not a follower of Gouin. Although the work suggests the influence of other writers in the field, the author is an independent thinker and his discussions are refreshingly original. And his work is a refutation by example of the contention that every kind of language study must needs be conducted on historical lines. It is a systematic study based on the principles of normal psychology. It is the author's view that pathology can throw no new light on normal speech. Nor does he believe that neurology has made any serviceable contribution to the subject, for at least as far as language is concerned there is no agreement in that field on anything that may be turned to practical account in speech pedagogy.

The work is divided into three main parts: first, Word-imagery; second, Language as Expression of a Thought Content; third, Relations of Language to the Whole of Mental Life. The sub-divisions under the first heading are, the nature of sound perception, the speech sounds, word-imagery of sight and movement; under the second, the mechanical structure of language (not the mechanism of speech, which is not taken up), form (inner) and content of language, meaning; under the third, relations of the word to other kinds of imagery, meaning of feeling to language acquisition, the will and language acquisition.

Of the three main parts, the author is at his best in the first two, and the content of these parts is also far more important to the student than that of the last. A reader who is pressed for time could omit the last part without missing the vital and most essential elements of the study.

The author begins his first chapter with the distinction between natural and artificial imagery. The first is based on perception of sound and of movement, the second on words as seen in script and print and on the movement of the hand in writing. To be exact, to the first must also be added the movements of the speech organs and gesture as seen. In one who commands a language on all its sides, all these activities must be conceived of as working together and as leaving their corresponding impressions and imagery. When one regards himself as being a visualist, an audile, or a motile, it must be only in the sense that one or the other of these forms dominates the memory, and not that one or another kind of imagery is independent and isolable. In this the author holds to Höffding's theory of the "psychische Chemie" according to which the sense-impressions and images are not to be regarded as strictly separable but as fusing into new qualities or at least into unities which do not admit of direct analysis. These unities seem by introspection to be characterized by corresponding single sense qualities, but it is only because the other elements which accompany them recede for the time being in the consciousness in favor of the one to which attention is being directed. If the active will element were not added in this way to mere association to produce this unity, language impressions would be one great chaos. On this basal principle the author discusses types of imagery and the interrelations between the different kinds of images, concluding, that for the memory of a sound the connected image of movement is of prime importance and, finally, that *the necessary condition for the union of the sound*

image with the rest of the content of consciousness is its fusion with the images of space, of material, and of movement. In other words, this is the condition of the permanent retention of the sound image, the condition of acquiring the sounds of a foreign language. Thus the sound impression forms with the connected impressions a complex which it is not possible to disintegrate. This is the fundamental principle on which much that follows in the rest of the book is based.

With Stricker the author regards motor images as an ever-present element in word-imagery, but he attaches an importance to the accompanying sound image not to be found in either Stricker or in Wundt. That the word is an act and that the mastery of this act can be gained only by carrying out the whole act in all its branches repeatedly, is a point of view which the author says must never be forgotten in the pedagogy of language. This principle is emphasized again in the chapter on the acquisition of the language arts, reading and writing. This entails opposition to the view of which Ballet finds confirmation in his study of aphasia, that the imagery of writing is somehow coördinate with sound and motor imagery. Says our author, "We do not write from the visual impression of the script but rather gain our visual impression of the script from writing." In reading, what Höffding regards as the immediate association between the word-sign and the thought the author explains by the theory of the rapid movement of images; so rapid as not to be recognizable as entities. This is his substitute for the imageless thought of the Wurzburg School, for Ribot's latent rôle of motor imagery, and Wundt's theory of dispositions or tendencies. He holds that we always think in images (Anschauungen), which may be accompanied by words or be free from them, rejecting the view of Burkhard that we think in two ways; in language and in images (Anschauungen). In another connection the author supports the view that when speaking begins thinking stops.

But whatever may be the character of visual reading, whether imaginal or not, it is not the means of acquiring a language. The author believes with Sweet that there is only "one method for all." A language is acquired through the natural word-imagery, the acoustic-motor, and not through its "visual appendix," however prominently the visual element may stand out in the consciousness.

Finally, the author lays stress on the value of having the pupil see the teacher speak, but does not go so far as M. Schweitzer, who advocates the addition of facial mimic and gesture.

Under "Sprachmechanismus" is comprehended what one might call the anatomical structure of language as such. Here (to give the contents of the chapters in rapid succession) he ventures a discussion and definition of the word, theorizes on word-individuality, or the tendency to regard a word as a separate, individual entity which we sometimes seek in the consciousness somewhere, which is "on the tongue," perhaps, but slips away before it is caught. Although the word comes to the consciousness as a unit, it is the result of a certain selection and uniting of parts. Then follow, the unity of the phrase, the nature of inflection; origin, theory, and definition of the sentence; the relation between sentence and word, the word in child language, the transition from the association of ideas to the associations of sound, the problem of the translation, and kindred topics.

It would be interesting, if space permitted, to follow the author's exposition of inner speech form (which he prefers to call "Ausdrucks-

gestalting") the psychology of translation, the methods of grammatical instruction and their dangers.

Meaning has a qualitative moment and a quantitative moment. It is the tendency of a word to arouse definite images belonging to the content of consciousness. The four chief forms of language that the author cites are familiar language, the language of formal intercourse, scientific and technical language, and literary language. It is easier to acquire the language of formal intercourse after acquiring familiar language. The reverse way is unnatural. And the author emphasizes particularly the necessity of doing work in a foreign language in its living, spoken form. A literature that strikes a good average, something that represents the mode of thought of the common people, is to his mind preferable to a literature that has become classic. Progress in language acquisition goes from the concrete to the abstract, that is, from the larger to the smaller complexes of the associated activities of expression.

There is a large and well-selected list of references given, including, with a few notable exceptions, all the recent works related to the psychology and pedagogy of language. It is significant that only one English and one American work is mentioned, the latter published in 1885 and related to the subject under the discussion only in a general way.

This would seem to show a lack of interest among American scholars in a field of vital educational importance not alone for the modern foreign languages but also for the study of the mother-tongue; a field to which the largest amount of time is devoted in the curriculum of the high school and the college. The fundamental principles of the pedagogy of language have never been given any attention to speak of in America. This book is on the modern language side of the subject the most satisfactory treatment that has been attempted. For this and other reasons the book will commend itself to the attention of the American teacher who if he has not kept in touch with the European movement along this line can find here, incidentally, a synthesis of the best European thought on the subject of the last fifteen years. To the teacher who has read widely on the subject it will also be of great value for its suggestive and stimulating exposition of fundamental principles combined with applications and illustrations which a teacher of experience can appreciate. It exhibits in a most conspicuous way the practical value of the psychology of language and the fruitfulness for pedagogy of a non-historical approach to language problems.

FRANK K. SECHRIST.

School Hygiene. By FLETCHER B. DRESSLAR, Ph. D. New York, Macmillan, 1913. 369 p.

This is a clear, concise treatment of the subject. The book covers the field so well that any teacher, rural, city or college, will find in it material which he can and should use in his teaching. To members of school boards and to laymen, it will prove interesting and valuable. Though it is not written for the specialist, he will find the author's treatment of the topics and the bibliographies at the close of each chapter of service. The book is well made and the cuts and diagrams it contains add to the lucidity of the text.

A chapter on Play and Playgrounds brings out their function in education, hygiene and morals. The author shows that we need to take more care of girls in these respects than has been customary.

In line with other investigations showing rural communities and pupils in an unhygienic state, it is also found they are lacking in proper play and playground facilities.

The school ground, the position and construction of the school building, its seating, furnishing, heating, lighting and ventilation are treated in the light of recent investigations, experiments and experience. The chapters on "Toilets," "Drinking Cups and Drinking Fountains" and "Convenient and Sanitary Water Supply" show the nature of these needs and how, even in rural schools, they can be obtained without excessive cost. With the arrangements suggested, rural and village as well as city schools could provide baths. On this subject there is a valuable chapter.

The discussion of Pure Air, Open-Air Schools and Humidity indicates how complex and closely related are heating and ventilation. Healthy pupils, as well as sick, need open-air schools and all should have as much open air as possible. Means are shown whereby one-roomed buildings may have good if not perfect heating and ventilation. The treatment of humidity is probably of more value to the specialist than the general reader who, however, will find it suggestive. Some of the suggestions seem inapplicable to a large number of the schools of the country.

A study of Dr. Dresslar's treatment of Eye Defects, Hearing, Teeth and Fatigue will enable one to detect some pathological conditions. Besides indicating the nature of such conditions, he describes practical tests and apparatus necessary for their application. The author probably does not attach enough significance to the rôle of heredity in eye defects. He points out that if the teeth are saved, it must be between the ages of five and fourteen. Adenoids should be removed early as they prevent the proper development of the teeth. Too much use of baby pacifiers may affect the child in a similar way.

One of the best and most important chapters in the book deals with the "Hygiene of Instruction." "It is good hygiene to make the schoolroom a place of vigorous, earnest effort on the part of every pupil," says the author. To this end the work must be systematized. The pupil must be helped to acquire the time sense, to have a time for everything and to do everything in its time. This may be done, partially at least, by studying with him, by being definite in assignments and rigid in requirement of what the lesson contains. The subject matter must be such as to come within the possibilities of interpretation in terms of his own experience.

The spinal cord and lower centers should be made to do the mechanical and oft-repeated work of life, thus relieving the brain. This can be accomplished by *accuracy* in learning; for the spinal cord will give a true record of such impressions in the returning expression.

The program should be arranged with proper alternation of formal and content studies with liberal intervals of rest. The most difficult work should be given when the pupils are fresh.

Physical hygiene is not to develop specialists, but normal healthy men. This point should be emphasized in athletics.

The chapter on Medical Inspection of School Children, like some of the recent books on this subject, may give the reader the impression that such inspection is of a quality and extent greater than exists here. The need of it is clearly indicated. The author's ideals are good but perhaps Utopian. He has failed to indicate what is to be done for the pupils of the village and rural schools, who form the majority of our school population.

Medical inspection will not lessen the work of the teacher, for she

will ever be the first aid to the pupil, nurse and inspector. She should know the defects, diseases of childhood and their symptoms.

Dr. Dresslar's discussion of the qualifications and duties of a school janitor is a valuable contribution to the subject of school hygiene. For this chapter alone, the book is worthy of reading by schoolmen, members of school boards and janitors. The facts show that the janitor should be a man of decided mechanical ability, of good personality, steady loyalty, and excellent character. Explicit directions are given for the proper care of the school plant, including such topics as sweeping, dusting, heating, etc.

Other chapters deal with Stuttering, The Care of Defective Children, Hygiene of School Utensils and Books, Cleaning School Rooms, and Disinfectants.

GEO. E. JONES.

BOOK NOTES

Handbook of opportunities for vocational training in Boston (regular college courses excepted). Compiled by the committee on opportunities for vocational training of the Woman's Municipal League of Boston, Education Department. Edited by THOS. C. MCCRACKEN. April, 1913. 6 Marlborough St., Boston. 301 p.

The world now requires special training in more and more departments of life, and this excellent work is a very valuable addition to this subject. The first part contains an alphabetical list of subjects taught in the vocational schools and classes of Boston, with the name of the school, age and sex of the students, time of session, etc. The second part classifies information regarding schools, professional (art, handicraft, music, dancing, nurses, teachers, miscellaneous), commercial (including public and private), industrial (for men, boys, girls, women, both sexes, endowed and private, public), and schools for training in the household arts. The third part contains supplementary information, organized opportunities for training for the physically handicapped, also for training in settlements and other social centers in Boston, opportunities for finding employment, homes for students in associations or clubs, classified index of vocational schools and classes, alphabetical index of schools and classes, addresses of schools of college grade. There are also good maps of professional, commercial, industrial and other schools in Boston and vicinity.

The hygiene of the school child. By LEWIS M. TERMAN. Boston, Houghton, Mifflin Co., 1914. 417 p.

This volume, very appropriately inscribed by a former student to Professor W. H. Burnham, "without whose inspiration the work would not have been undertaken," treats of, first, the broader relations of educational hygiene, and then discusses the physical basis of education, general laws of growth, factors influencing it, some physiological differences between children and adults, the educational significance of physiological age, disorders of growth and the hygiene of posture, malnutrition in school children, tuberculosis and the school, physiology of ventilation, teeth of school children, hygiene of the nose and throat, defects of hearing and the hygiene of the ear, hygiene of the eye, headaches, preventive mental hygiene (the nervous child, common neuroses of development, the education of nervous children), speech defects and the hygiene of the voice, sleep, some evil effects of school life, suggestions for a teacher's private library on the hygiene of physical and mental growth. The work contains eight illustrations and thirty-three figures and charts. It is a valuable, up-to-date work by one of the livest and best men in the field.

Introduction to the study of English literature. By VIDA D. SCUDDER. Rev. Ed. Yonkers-on-Hudson, N. Y., World Book Co., 1914. 542 p.

It is indeed no light matter to present the story of the imaginative life of the English nation in 542 pages, and like nearly all the

other modern textbooks in the field, this is designed to accompany copious reading of texts. The selective principle is applied severely and the work is designed for high schools and not for colleges or universities. Much stress is laid on matter before Chaucer. Part first describes courses; part second, the middle ages, with chapters on chief phases, literature produced in England, Chaucer, the mediaeval drama and the fifteenth century; part third is the Renaissance, and then follows Elizabethan literature, Sir Philip Sidney, Spenser, early drama, Shakespeare, decline of the drama, Milton, and Puritanism. Part four is the age of prose, Dryden, age of Queen Anne, rise of the novel, Jonson, intellectual and romantic movements; part five, modern England, the new democracy, Wordsworth to Keats, Victorian literature.

School costs and school accounting. By J. Howard Hutchinson. New York, Teachers College, Columbia University, 1914. 151 p.

As to school costs, this monograph treats its purpose and that of the investigation, actual statements, studies of twenty cities, cost per pupil, average daily attendance. Part second, on accounting, describes requisitions, payrolls, various ledgers and financial statements, and the third part gives a model system.

Support of schools in colonial New York by the society for the propagation of the gospel in foreign parts. By William Webb Kemp. New York, Teachers College, Columbia University, 1914. 279 p.

The events that led up to the founding of the S. P. G. are first described and then its work at home and abroad, its regulations concerning schoolmasters. This constitutes part first, and part second is devoted to the support of schools in the colony of New York, its charity school in 1706, its work in Westchester County, Staten Island, Long Island, the upper provinces, its catechising school in the city of New York, and the allied negro schools of the Bray Associates, and finally the routine and curriculum. The support of schools in the province of New York is only one chapter in a vast program of colonial evangelization. The chief motive of the society was to extend Christianity throughout America according to the Church of England. The great desire in London was to stimulate the inhabitants to the self-support of their schools, so that the work of the society might pass on to other places that were in greater need.

Parents and their problems; child welfare in home, school, church and state. Edited by Mary Harmon Weeks. Washington, D. C., National Congress of Mothers and Parent-Teacher Associations, 1914. 8v.

This series of eight volumes by some sixty prominent authors constitutes a thesaurus of literature upon the comprehensive and vital subjects it treats. The titles of its eight volumes are as follows: education for parenthood; physical care; ideals of child training; methods and material of training; school problems; coöperation of home and school, church and state. In a multitude of counsellors is wisdom and the encyclopedic character of this work is its most salient feature. The last volume, for instance, contains no less than forty-six articles on as many different subjects, and while there is a good deal of difference in the merits of the scores of articles that constitute the volumes, as a whole they are an

excellent summary of the best things that parents ought to know, and represent a great many different points of view. If we were disposed to criticize we should query the propriety of some of the photogravure full-page cuts inserted in the volumes.

The education of Karl Witte; or the training of the child. Edited by H. Addington Bruce. New York, Thomas Y. Crowell Co., 1914. 312 p.

The editor first tells us for whom his book is written, then "Was my son born with extraordinary aptitudes? Does my educational work proceed successfully? Is my son's education finished? He may become a superior man if properly educated. Shall I make him a precocious scholar, and how if he is to be such? Have I the skill to make him a scholar? Objections to the early education of my son. Did he profit from it? Should children be left to themselves up to the seventh or eighth year? How we guarded him against flattery. His toys. Playing with other children. Diet. Moral training. How he learned to read, write, work play. Rewards. How he learned languages, sciences, taste, and how he finally goes to college." This book is, of course, a translation.

Growing a life. By Charles Evans. Chicago, Rand, McNally & Co., 1912. 214 p.

This book, we are told, is born of a desire to serve. It views pedagogy as a life process. The author treats the law of laws, of continuity, mind and force, growth, consciousness, self-activity, righteousness, happiness the birthright, food, stimuli, training, appetite, time, freedom, powers, processes, and the great ideal. It is a vital book, written by a man who has come into close practical quarters with his subject, and it closes with an instructive and economic outline.

The message of new thought. By Abel Leighton Allen. New York, Thomas Y. Crowell Co., 1914. 269 p.

New thought is the culmination of many recent cults, and this volume aims at a clear and distinct statement of the principles of the philosophy signified by the term. The author seeks to set forth the divergence between the new system, orthodox creeds and Christian Science. Some of the chapter subjects are: definition of new thought, origin of the creeds, universal mind in man, man illimitable and unfinished, as a man thinketh, ethics of the creed, voices of the new free thought, the art of living.

The problem of immigration in Massachusetts. Report of the Commission on Immigration, 1914. Boston, Wright and Potter Printing Co., 1914. 295 p.

This is a most invaluable pamphlet, copiously illustrated with photographs, charts, curves, and is one of the most instructive pamphlets that has come to our notice upon this ever more vital topic.

The psychology of management; the function of the mind in determining, teaching and installing methods of least waste. By L. M. Gilbreth. N. Y., Sturgis & Walton, 1914. 344 p.

Psychologists and pedagogues will be interested in this summary statement of one of the masters of the efficiency movement. He

has first described the psychology of management; then follow interesting chapters on individuality, functionalization, measurements, analysis and synthesis, standardization, records and programs, teaching, incentives, and welfare.

How to rest. By GRACE DAWSON. New York, Thomas Y. Crowell Co., 1914. 56 p.

This little book aims to point out practically the restful way of living and to show an intimate connection between the body and the soul. The author treats of rhythmical living, nerves, mental tension, temperament, physical and spiritual tension. She does not attempt erudition but her muse is common sense.

The trial balance and other stories about schools. By C. W. BARDEEN. Syracuse, N. Y., C. W. Bardeen, 1913. 229 p.

Mr. Bardeen is the story writer of the school system, and this volume shows that he is improving with years. He writes with a masterly inside knowledge of schools, teachers and their aims, always holds up the highest standards and ideals, and everything he writes is eminently readable. May he long continue!

In freedom's birthplace; a study of the Boston negroes. By JOHN DANIELS. Boston, Houghton Mifflin Co., 1914. 496 p.

This is an admirable sociological race study by a most competent and enthusiastic student. The chapters will give an indication of its scope;—slave, patriot, pioneer freeman, a race delivered, equal rights and public favor, reaction, the negro forced upon his own resources, taking root, social construction and ethical growth, the upward struggle of the negro church, the ballot, economic future, the future of the negro people. There is an appendix, and statistical tables follow. The author was for years a very efficient secretary of the Congo Reform Association and his book is in some respects a model of its kind.

Oklahoma civics and history. By CHARLES EVANS and CLINTON ORRIN BUNN. Oklahoma City, Bunn Bros., 1913. 244 p.

This is an interesting hand-book to give students a knowledge of federal government in general, and it is designed to be fitted to school, pupil, teacher and home. It contains quotations, illustrations, songs, and earnest language to incite patriotic fervor, embraces new history, is designed for a four months' course. It treats the evolution of society, family, school, district, town, voting, party machinery, county, village, city, state, and its sovereignty, the nation, insular possessions, diplomatic service, state land department, court procedure, the flag, and finally Oklahoma history.

Rural schools of Canada; their organization, administration and supervision. By JAMES COLLINS MILLER. New York, Teachers College, Columbia University, 1914. 236 p.

There has certainly been a quickening of national consciousness in Canada in recent years, which is the natural outcome of the remarkable development of the past decade. This work surveys the educational systems of Canada in their relationships to rural education, treating of financial support, teachers' courses, attendance, buildings, conveyance, advanced classes and outside agencies, including

agricultural. Part second is devoted to inspection and supervision of rural schools, appointment of inspectors, duties, conditions under which they work, improvement of inspectors.

The church, the people, and the age. Edited by Robert Scott and Geo. Wm. Gilmore. Annals and summary by Clarence Augustine Beckwith. N. Y., Funk & Wagnalls Co., 1914. 571 p.

This book is composed of contributions by perhaps one hundred prominent men in answer to a circular letter asking why so many are indifferent to the church, whether it is wise to ask most people to subscribe to statements that deal with controverted questions, what should be the basis and direction of a fundamental theology of the church. The replies are grouped, analyzed and summarized, but it must be confessed that there is such diversity of opinion that, interesting and valuable as the work is, it can hardly tend to advance anything like a consensus of opinion upon the subjects dealt with.

Laboratory manual for human physiology; experimental studies in hygiene, sanitation and physiology. By Carl Hartmann. Yonkers-on-Hudson, World Book Co., 1914. 144 p.

This manual is prepared for use with Ritchie's "Human Physiology" and its goal is simplicity. The work is planned for half a year. The apparatus is made as simple as possible, and there are plenty of exercises as the work proceeds. It contains 27 cuts, mostly of very simple physiological and biological apparatus, drawn in a way to illustrate their use, which the student is supposed to manipulate.

Pillars of society. By A. G. Gardiner. London, James Nesbit & Co., Limited, 1913. 354 p.

This is a very interesting sketch of forty prominent men and a few women, all alive to-day or until recently, from the most diverse walks of life, most of them accompanied by a photograph. The range of selection will be seen by the following names: King George V., Kuropatkin, Sarah Bernhardt, Carnegie, President Wilson, Mrs. Humphrey Ward, Patrick Geddes, Forbes-Robertson, Roosevelt, Lord Strathcona, James Bryce, and H. G. Wells.

For girls and the mothers of girls; a book for the home and the school concerning the beginnings of life. By Mary G. Hood. Indianapolis, Bobbs-Merrill Co. 157 p.

This work contains 28 chapters, of which the following will give an indication of its scope; how plant and animal life begin, the egg, germ cell, mammals and their young, the egg and ovary, reproductive organs, pelvis and its organs, how the ovum finds its way to the uterus, how cells grow and multiply, how the pollen unites with the ovule, fertilization, conception and motherhood, development of the human embryo, provisions for the growth of the human infant, birth, feeding, menstruation, how the girl should keep well, hygiene of the menstrual period, exercise, cleanliness, moods, emotions, friendship, marriage, parenthood. The work is far from being medical, has a few copies of famous paintings, and is somewhat sentimental in the sound sense of that word.

The correlation, unification or synthesis of chemotherapy and psychotherapy. By HENRY S. MUNRO. (Reprinted from the American Practitioner, New York, Nov. and Dec., 1913.) 31 p.

The principle of relativity in the light of the philosophy of science. By PAUL CARUS. Chicago, Open Court Publishing Co., 1913. 105 p.

The Massachusetts home-project plan of vocational agricultural education. By R. W. STIMSON. Washington, Govt. Printing Office, 1914. 101 p. (United States Bureau of Education, Bulletin, 1914, no. 8.)

Fifty-ninth annual report of the board of education of the city of St. Louis, Mo., for the year ending June 30, 1913. 638 p.

The diagnosis of the higher grades of mental defect. By WALTER E. FERNALD.. (Reprinted from the American Journal of Insanity, vol. LXX., no. 3, Jan., 1914. pp. 253-264.)

Semi-centennial history of West Virginia. By JAMES MORTON CALLAHAN. With special articles on development and resources. Published by the Semi-centennial Commission of West Virginia, 1913. 593 p.

Instituts Solvay; Institut de Sociologie, Bull. No. 30. Archives Sociologiques, publiées par Émile Waxweiler. 5e Année, Fév. 1914. 353 p.

National Education Association yearbook and list of active members. Revised to December 31, 1913. Salt Lake City meeting. (N. E. A. Bulletin, Feb., 1914, v. 2, no. 3.) 386 p.

The policy of the state in determining the qualifications of her teachers. By THOMAS E. FINEGAN. Albany, University of the State of New York, 1914. 19 p.

Mother nature and her fairies. By HUGH FINDLAY. Syracuse, N. Y., C. W. Bardeen, 1913. 130 p.

Teaching of mathematics. By RAYMOND E. MANCHESTER. Syracuse, N. Y., C. W. Bardeen, 1913. 75 p.

Introduction to the study of English literature; from the earliest times to the close of the Victorian age. By W. T. YOUNG. New York, G. P. Putnam's Sons, 1914. 238 p.

Experimental psychology and pedagogy. By R. SCHULZE. Tr. by RUDOLF PINTNER. New York, Macmillan, 1912. 364 p.

This book is written to introduce experimental methods in psychology and pedagogy to a wider circle. It lays no claim to completeness. Its matter might be arranged according to apparatus, to methods, or the chief divisions of pure psychology. The latter is chosen and the author follows Wundt's terminology. Hence Chapter I is on the mathematical treatment of results in child psychology and pedagogy, dealing with measurements in physics, the error and mean, measurements in biology, Gauss's law, measurements in psychology, child psychology and pedagogy, changes in asymmetry, etc. Chapter II deals with measurement of sensation, the threshold, variation,

methods of limits and differences, the analysis of one sensation, viz., touch, Weber's law. Chapter III deals with perceptions and ideas, space, time, and statistics of ideas, analysis of the child's store of ideas with the help of speech and drawing and modelling. Chapter IV is feelings, how to observe them, investigations of the symptoms of outward expression, investigation of pulse, pressure and volume, outward expressions by speech, drawing mimicry and pantomime. Then comes the will, beginning with time error and reaction experiments with the graphic method, method of insertion, muscular, sensorial and natural reaction, and then consciousness and attention, assimilation, memory, perceptive combinations, speech, physical work, starting from the ergograph, mental work, psychical correlations. The book contains 314 cuts of instruments, curves, etc.

Education and psychology. By MICHAEL WEST. London, Longmans, Green, 1914. 341 p.

This book attempts a simple outline of psychology as applied at every point to the problem of schooling, but is primarily intended for a larger public than the school, and hence is untechnical. It points out psychological errors which lie at the basis of present educational systems. The work is divided into five parts. The first deals with meaning, scope, method of psychology and of the nervous system and fatigue. Part two deals with attention, sensation, perception, memory, intellect, and technical subjects. Part three deals with the imagination, liberal topics; part four, feeling, instinct, language and the self and its expression, and part five with education for action, the boy, the schoolmaster, the school, the alternative. The author evidently assumes to be original. The writer of this note has not found a single reference to another authority in it, and it is a little difficult to understand what the real *raison d'être* of such a book is, so that the question arises whether in attempting to be elemental the author has not been simply commonplace.

The purpose of education; an examination of the education problem in the light of recent psychological research. By ST. GEORGE LANE FOX PITT. Cambridge, University Press, 1913. 83 p.

This book treats human personality, emotion and instinct, character versus reputation, incentives to effort, economics, specialization, multiplex environment, religious ideals, and twice-born.

Natural history of the farm. By JAMES NEEDHAM.

This interesting and rather novel book is divided into three parts. The first is for the fall term, from October to January, describing Mother Earth, the wild fruits and nuts of the farm, its stream, fishes, pasture, plants, wild roots, deciduous trees, woodlot, fuel woods, winter verdure, wild and domesticated mammals, landscapes, with optional individual exercises, a student's record of farm operations, noteworthy views, trees, autumnal colors, a calendar of seed dispersers. Part two, for the spring term, describes the lay of the land, deciduous shrubs, winter activities of wild animals, fibre products, ice, maple sugar, soil, passing of trees, the fence row, spring planting, a cut-over woodland thicket, spring flowers, apple blossoms, bird songs, also with exercises. Part three, for the summer term, deals among other things with clovers, aromatic herbs, trees, woods, flowers, insects, rain, vines, swale, brambles, old apple trees, swimming holes, winding roads, etc.

How man conquered nature. By MINNIE J. REYNOLDS. New York, Macmillan, 1914.

This little booklet in the Every Child's Series describes the first manufactures, the beast-farmer and his helpers, how man got the food plants, the story of man's clothes, what the mineral world furnishes, man as a servant, the machine, the growth of civilization through money, trades, tools, the conquest of all, why our race has conquered, the quest in the future. The book has a very few illustrations, most of which, to the mind of the writer of this note, rather detract from than add to its value. Some of them certainly are not well chosen and all are poorly executed.

Ethik als Kritik der Weltgeschichte. Von ALBERT GŐRLAND. Leipzig. B. G. Teubner, 1914. 404 p.

After a long introduction describing philosophy as idealism, realism, criticism, and the relations of logic and ethics, the author discusses the problems of ethics that arise from the separation of social sciences. There are here dangers of limitation from hedonism, historism, mysticism, economy, self-consciousness, the State, community, etc. The second part of the book, entitled systems of ethics, deals first with the basal law of truth, then the freedom of the will, economic society, with very many discussions of social themes.

Das freie literarische Schaffen bei Kindern und Jugendlichen. Von FRITZ GIESE. Zwei Teile. Leipzig, J. A. Barth, 1914. 242 p.

This is the second part of a very comprehensive study of literature by children, of which a copious collection was first made, and the work consists in first describing the method and material and then treating the form, theme, *Stimmung* and character, the factors that influence juveniles to write poetry, an analysis of single specimens, differences in sexes, in age, and finally, eroticism.

Special method of instruction. By FELIX ARNOLD. Volume 0, Develment, chiefly visual. New York, S. Mandel, 1913. 416 p.

We here have an interesting compend of methods in arithmetic, reading, physics, speaking and dictation, composition, language forms, geography, history and nature study. The work is designed to aid teachers in their daily practical work.

Commercial education in Germany. By FREDERIC ERNEST FARRINGTON. New York, Macmillan, 1914. 258 p.

This admirable compend treats first of Germany and its educational system in general, then of the lower commercial schools, which topic is treated with greatest detail. Then follow chapters on secondary commercial schools, the colleges of commerce, with appendixes on apprentices' indentures and lessons in commercial English.

A CORRECTION

The publishers have called the attention of the PEDAGOGICAL SEMINARY to an error in reviewing the English Grammar by William T. Harris in the last number. The review was written under the assumption that the author was the late Hon. William T. Harris of the Bureau of Education, which is not the case. He is another man of the same name.